ISLAMIC AZAD UNIVERSITY

SCHOOL OF MEDICINE

THESIS :
FOR DOCTRATE OF MEDICINE

SUBJECT :
Identifying prevalence Rate of epileptic's MRI Abnormalities which older than 18 y (in neurology clinic of Amir General Hospital in Tehran between dates (82/11/1 _ 83/6/31)

Thesis Advisor :
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واحد پزشکی
کتابخانه مرکزی واحد پزشکی

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IN THE NAME OF GOD

This book is dedicated to my dear master

Dr. Khamseh.

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Introduction

A seizure (from the latin sacire, "to take possession of") is a paroxysal event due to abnormal, excessive, hypersynchronous discharges from an aggregate of Central nervous system (CNS) neurons. Depending on the distributin of discharges, this abnormal CNS activity can have various manifestafion, ranging from dramatic convulsive activity to experiential pheneomena not readily discernible by an observer. Although a variety of factor influence the incidence and prevalence of seizure approximately 5 to 10% of the population will have at least one seizure during their lifetime, with the highest incidence occuring in early childhood and late adulthood.

In this research my attempt is based on Identiging prevalence rate of MRI abnormality as a causative factor (or not) for trigerig of epilepry in the descriptive prospective Cross sectional study in neurology clinic of Amir General hospital. The meaning of the term seizure need to be carefully distingnished from that of epilepsy. Epilepsy describes a Condition in which a person has recurrent seizure due to a chronic, underlying process. This definition implies that a person with a single seizure, or recurrent siezure due to correctable or avoidable cirrcumstance, does not necessarily have epilepsy. Epilepsy refer to a clinical phenomenon rather than a single disease entity , since there are many forms and Cause of epilepsy However,

among the many Cause of epiliepsy there are various epilepsy syndromes in which the clinical and pathologic characteristies are distinctive and suggest a specific underlying etiology.

Using the definition of epilepsy as two or more unprovoked seizures, the incidence of epilepsy is approximately 0.3 to 0.5% in different population throughout the world and the prevalence of epilepry has been estimated at 5 to 10 person per 100. Why MRI should be used?

According to Merit (text book of neurology 2000): MRI should be performed in all patients over age 18 years and in children with abnormal development, abnormal finding on physical examinatin, or seizure types that are Likely to be manifestation of symptomatic epilepsy. CT scan will often miss common epileptogenic lesions such as hippocampal sclerosis, Cortical dysplasia, and Cavernous malformations. Because CT scan is very sensitive for detecting brain calcifications, anoncontrast CT (in additin to MRI) may be helpful in patients at risk for neurocysticer cosis. Routine imaging is not necessary for children with idiopathic epilepsy, including the benign focal epilepsy syndromes. Brain MRI, Although more costly , is more sensitive than CT in detecting potentially epieptogenic lesion, such as cortical dysplasia, hamartomas, differentiated glial tumors, and cavernous malformations. Both axial and coronal planes should be imaged with both

T_1, and T_2 sequences. Gadolinium ingection does not incvease the sensitivity for detecting cerebral lesions but may assist in differentiating possible causes.

Historical Events in epileptology

Epileptology has a long history, Probably as ancient as that of man himself. It is a history of evil spirits and Curses, hence a history of medical ignorance and extreme human suffering.

The word epilepsy is derived from the Greek word epilambanein: to take, to seize.

In other words, an evil spirit "takes over" or "Seize" the patient.

Hippocrates, Aretaeus (mal d'Hercule), Celsus (morbus sacer), and plinius (morbus Comitialis) between 400 BC and 200 AD, gave interesting descriptions of major and even minor seizures. Insight in to the cerebral origin of epileptic seizuresis found in the work of Hippocrates, Although a modern picture of epileptology started to arise in the second half of the 18 th century by (The Traite de l'epilepsie) of Samuel Auguste Tissot an eminent Swiss physician. He was aware of cerebral lesions (tumors, etc) as the cause of epilepsy therefore his therapeutic approach was based on a reasonable assortment of sedative medication. Gradually, in 19 th century,

great progress has been ushered in distinction of minor epileptic seizures. Fine clinicol observation disclosed the special nature of certain "psychical equivalents" seizures presently known as psychomotor or coplex partial.

Therapeutic Development: The treatment of epileptic patient progressed in a quantum leap with the introduction of the bromides. Unfortunately, the bromides turned in to a neuropsy chiatvic panacea during the 19 th Century. The advent of the barbiturates and especially the introduction of phenobarbital ushered in the era of modern Conservative epilepsy treatment.

Neurosurgical therapy of epilepsy may have an archaic origin, presumably in the neolithic period. Cranial trephine holes for the escape of spirits or more realistically for the evacuation of subural hematomas in wounded warriors were performed especially in the early Inca period.

Modern epilepsy surgery start with Horsley but did not receive its major impetus before the 1930s.

Review of Reference:

(Journal Neuology Neurosurgery psychiatcy. 2003 Apr): Clinical application of neuroimaging in epilepsy. 919 outpatient were identified and the scan results reviewed. 391 patient had no scan but 528 patient had a

scan although result were not available in 33. 163 had x Ray computed tomography only. 178 had standard magnetic resonance imaging (slice thickness 5 mm). And 154 had high resolution MRI (including a T1 weighted sequenze with 1.5 mm thick slices(. Some 252 of 495 Scans (51%) were normal. Abnormality were: hippocampal sclevosis (n=128), atrophy or nonspecific white matter lesion (n=35) vascular abnormality (n=27) tumours (n= 25) brain damage (n= 24) malformation of cortical development (n = 13) . Excluding atrophy and nonspecific white matter lesions the prevalence of detected abnormality was 54% in localisation related epilepsy, 18% in single seizure patient, 16% in epilepsy in remission and 0% in idiopathic generalized epilepsy and non epileptic attacks.

(Journal Indian med Association 1994 April): Magnetic Resonance Imaging spectrum of epilepsy: In 361 patient with strong clinical suspicion of secondary epilepsy, MRI was performed. 345 patient revelaed a positive study . Maximum number of patients (28.3 %) were in the age group of 2 to 12 years without any fignificant sex predilection. More than 70% patients presented with generalized seizure, Mri revealed definite evidence of tuber culoma in 98, neurocysticercosis in 86, tumour in 60 and cerebrovascular accident in 23 patients.

(Journal sante 1999 Jan – Feb): Contribution of Conputed tomography in diagnosis of Symptomatie epilepsy : This study in clude: 205 CT scans carried out in patient with symptomatic epilepsy: This study include: 205 CT scans carried out in patient with symptomatic epilepsy. That identified 52 (25.36%) Pathological causes: 18 Cases (34.62%) of infectious lesion, predominantly toxoplasmosis, 9 Cases (17.30%) of tumrs, 9 Cases (17.30%) of vascular lesions and 8 Cases (15. 39%) of post traumatic and atrophic lesion.

(Journal Epilepsy Research 1988 Jan – feb): magnetic Resonance imaging in epilepsy: a controlled study: The authors present a study of 50 Patient with epilepsy and 14 heal thy Control using a MRI. Gross inspection of MRI scans identified major cerebral pathology and supplemented CT scan data. With further analysis of spin – lattice (T1) relaxation times Significant difference from controls emerged in epilepsy patients even with normal CT scans, particularly in the temporal lobes. Patients with generalized seizures had inereased T1 values in the thalamus. Also prolonged T1 in patients with focal seizure was noted on the ipsilateral side.

(Gac Med Mex. 1999 Jul- Aug)

Epilepsy in the adult: Aprospective study of 100 Cases: The onset of epileptic Seizures after 20 Years old (late onset epilepsy) explain 20 to 25% of epileptic patients. The etiology is diverse and includes neurocysticercosis, brain tumors, brain infarct, etc. Approximately 50% of these patients will have structural brain damage as a Cause of the disease Prospective study of 130 adult patients with adult onset of epilepsy after 20 years old, studies since February 1989 to June 1997. All the patient had CT scan of brain, and when necessary brain MRI.

According to this study, There was structural brain lesion in 51% of patients. The most frequent cause of seizure was neurocysticercosis (28%) followed by Cerebral in farct (11%) and brain atrophy (11%).

(Euro Radiol, 2002 Mar): Magnetic Resonance imaging in epilepsy that is refractory to medical therapy: The aim of this study was the assesssment of detection rate on MRI and description of MRI finding in patient with medically intractable epilepsy. 73 patients with medically intrractable epilepsy between the age of O and 68 years old were evaluated by MRI, on three planes with spin – echoT1 , fastspin – echo T2 , and fluid – attenuated inversion recovery sequences , and if necessry, with contrast – enhanced SET1 sequences. Cerebral in faret regions with atrophy and gliosis in 8

patients, cerebral tumors in 5 patients, hippocampla sclerosis in 16 patients, radial microbrain in 1 patient, Cortical dysplasis in 3 patients, pachygyria in 2 patients, subcortical heterotopia in 2 patients schizencephaly in 3 patients, cerebral hemiatrophy in 2 patients, tuberous sclerosis in 1 patient, herpes encephalitis in 2 patients, Rasmussen's encephalitis in 1 patient, vascular malformation in 5 patients, and no abnormality in 22 patients were detected.

MRI play a primary role in palnning of the treatment, primarily surgical therapy, by detecting structural epileptogenic lesions.

(Nervenarzt. 2001 Dec): Reversible bilateral Cortical MRI changes as sequelae of Status epileptieus: Neuroimaging may detect structural and functional changes following seizures. Magnetic resonance imaging studies showed increased signal in tensities in T2 and diffusion – weighted images, especially in temporal cortex. We report a patient with reversible symmetrical signal abnormality of the insular cortex after seizures. In addition, the frontal paramedian Cortex and the central region were involved. There was no leptomeningeal or parenchymal enhancement on contrast – enhanced T1 – weighted images, suggesting an intact blood brain barrier. Upon follow – up examination 12 days later, the signal abnormality resolved completely. Reversible hyperintensities on T2 weighted images

are due to different Cause leading to inereased water Content Such as demyelinisation or edema as a cytotoxic edema assumed because of excessive glutamate Concentration and other noxious substances.

Objective:

The aim of this study include evaluation the use of neuroimaging especially MRI in clinical practice and to assess the prevalence of detected structural abnormality in epilepsy patients older than 18 years old in a clinical set up.

In the other aspect: Assessment of any male or female dominaney in any age group for epilepsy. Evaluation of current age for trigering of epilepry and safe age or low risk age for seizure phenomenon is also Mentioned. Control of any family history of epileptic patient for assessment of predictive value. An even head trauma probability in past time is questioned of patient as a structural cause of epilepsy had been checked. History of any Comorbidity that Concomitant with epilepsy which may change therapentic plan of patient is Completely observed. The pharma cotherapy of any patient sharply registered which instrument for comparing of different method of treatment in various type of epilepsy. Asking about age of epilepsy begining is important for detecting Adult onset epileptical Syndrom from child onset Convulsion. In addition to all aspect that mentioned above, any relation between date of reference or sex of patient or age and any Connection by treatment plan and other issue has been detected Curiously. But Cornerstone of this study is evaluation of

existence or not of any type of abnormality in MRI of epileptie patient older than 18 years old that Coming to neurology clinic since 20 January 2004 to 22 September 2004 as a prospective cross sectional descriptive study.

In addition to above, as a indirect finding prevalence Rafe of detailed types of epileptic Syndroms include: asimple partial seizure, Complex partial seizure, Partial seizure with Secondary generalization, Absence, tonic- Clonic , tonic , Atonic , Clonic, Myoclonic , and unclassified seizures had been identified. Any relation between special type of seizure and MRI Finding Can help to decide in according to cost / benefit ratio and even prediction of patients possible abnormality in Consideration to form of Convulsion and result of physical exam and another signs and sysptoms that may be existed Concomitant with patient's basic morbidity. Although there is reality that Some types of seizure is idiopathic and there were not any etiology had known.

Molecular Epileptology

Basic mechanism of epileptic activity are extremely complex and our insights have remained frgmentary. The approach is multifold: earlier work was aimed at large Cortical or deep Contingents of neurons, investigating

the paroxysmal responses of Cortical regions, acute resonse (to pical penicillin) or chronic build up of epileptic activity (topical alumina cream) There has been more recent emphasis on inhibitory and excitatory substaneas: on neurotrans mitters (glutamates, aspartated, glycine, GABA); selective ion transport and voltage – dependent gating of ion channels; and membrane proteins (polypeptides).

Another biochemical data in Seizure:

Taurine: Taurine is a sulphur – Containing aminoacid that is particularly Concentrated inexcitable tissues and appears to be a neuromodulator. Taurine transport is decreased in the brain and kidney of a genetically seizure – prone rat strain and taurine Content is decreased in the synaptosomal fraction of seizure – susceptible rats. Decreased urinary taurine excretion was noted in a human seizure group and genetic Control of taurine transport in the brain was postulated as one Component of a polygenic liability for seizures. In a study of 18 multiplex families, persons with generalized spike and wave (G.S.W) pattern on the EEG exereted significantly less taurine than other family members or Controls.

Haptoglobin: Low levels of plasm haptoglobin, a protein that binds and facilitates the clearance of free hemoglobin, were detected in 5 out of 14 multiplex families tested. This

Observation led to a hypothesis that low haptoglobin level (hypohaptoglobinemia) reduce an individual's ability to clear free hemoglobin from small bleeds that occur in the brain with modest head in jury (or even without apparent injury). As a consequence, the brains of hypohaptoglobinemic individuals may suffer prologed exposure to higher Concentrations of free hemoglobin a situation which has been denonstrated to be epileptogenie.

The Inos transport Across membranes: The role of sodium pump was stressed by O'Connor. Over the ensuing years, greater emphasis was placed on the in flux of calcium ions as the cause of neuronal depolariation and burst firing. Earlier emphasis on potassium and its role in neuronal epileptogenesis has dwindled following the use of potassium sensitive microelectrodes. The role of chloride in penicillin- induced neuronal discharges was investigated by uhlig et al. The ionic environment of the neuron is thought to be regulated by glial cells. The failure of glial functions to deal with excess potassium has been regarded as crucial in the initiation of an epileptice seizure.

Calcium antagonists have been found to counteract neuronal epileptiform discharges.

Role of neuronal Transmitters: Among the inhibitory neurotrans mitters, GABA and glycine are most widely known. Failure of GABA – ergic inhibition has been termed a key to local and global seizure. The substan tia nigra has been identified as a critical structure and the site of action for GABA – antagonis drug. Norepinephrine exerts inhibitory effects on epileptic nearonal activity also serotonin show inhibitory effects.

Glutamic acid and to a lesser extent aspartic acid are considered the most important excitatory neurotransmitters and thus involved in the initiation of epileptiform activity. Gulutamic acid decarboxylase is decreased in various types of epileptogenic foci. In human epileptic cerebral cortex removed during temporal lobectomy (under electrocortic ographic control) , Cortical epileptic activity was found to be associated with elevated Concentratins of glutamate, as partate and glycine, presumably indicating arelative imbalance between putative excitatory and inhibitory amino acid neurotransmitters. The role of glycine may appear to be confusing under these circumstances. It has been shown, however that glycine – presumed to be a major inhibitory neurotransmitter – may develop epileptogince properties and it is belived to Contribute to the intractability of seizures in patients with nonketotic hyper glycemia. The excitatory effect of acetylcholine, play a rather limited role in

epileptogenesis. A number of phosphorylation – dependent protein systems may be involved in epilepto form activity. Besides glutamate, the excitatory effects of aspartate, NMDA and quisqualate have been demonstrated. These substance cause a decrease in the extracellular Calcium Concentration and an in crease in the extracellular potassium Concentration.

The protein calmodulin is believed to mediate the action of calcium. Role of Neuropeptides: Peptides related to opiates (endogenous opioidlike peptides) were thought to exert Convulsive effect – especially beta-endorphin, met – enkephalin, and leuk – enkephalin – following intraventricular adminstration in the rat . On the other hand these substance also produce inhibitory and anticonvulsive effect: Seizures and stress full Situations may release endogennous opioid peptided and mediate post ictal depression and Postictal refractoriness. Opioid peptides may play a signifincant inhibitory role in limbic seizures. The pituitary peptide arginine vasopressin might have Convulsive effect and has been thought to be in volved in the genesis of febrile Convulsions. The hypothalamic thyrotropine – releasing hormone might lower the Convulsive threshold. Convulsive effect of somatostatin (barrel roteation) Convulsion in the rat) were pointed out by Cohn et al. Rather unclear is the mechanism of the

well known anticonvulsive effect of ACTH adrenocortico tropie hormone, a fairly specifie treatment in infants with infantile spasms (Wets's synrome).

Basis Mechanisms of seizure initiation and propagation : Partial Seizure activity can begin in a very discrete region of cortex and then Spread to neighboring region, i.e there is a seizure initiation phase and a seizure propagation phase. Studies of experimental models of these phases suggest that the initiation pahse is chareacterized by two Concurrent events in an aggregate of neurons: High – frequency burst of action potentials Hypersynchronization. The bursting activity is Caused by a relatively long – lasting. Depolarization of the neuronal membrane due to influx of extracellular Calcium, which leads to the opening of voltage – dependent sodium channels, in flux of Na+ , and generation of repetetive action potentials. This is followed by a hyperpolarizing afterpotential mediated by GABA receptors or potassium channels, depending on the cell type. The synchronized bursts from a sufficient number of neurons result in a so – Called spike clischarge on the EEG.

Normally, the spread of bursting activity is prevented by intact hyperpolarization and a region of surrounding inhibition created by inhibitory neuron. With sufficient activation there is a recruitment of

surrounding neurons via a number of mechanisms. Repetitive descharges lead to the following : an increase in extracellular K^+,which blunt the extent of hyperpolarization and depolarizes neighboring neurons. Accumalation of Ca^{++} in presynaptic terminals, leading to enhanced neurotransmitter release; depolarization – induced activation of the NMDA subtype of the excitatory amino acid receptor, which causess more Cain flux and neuronal activation. The recruitment of a sufficient number of neurons lead to a loss of the surrounding in hibition and propagation of seizure activity in to Contiguous areas Via local cortical connections. And to more distant areas via long commissural pathways such as the Corpus Callosum.

Many factors Control neuronal excitability , and thus there are many potential mechanism for altering an neuron's propensity to have bursting activity . Examples of mechanisum in trinsic to the neuron in clude: changes in the Conductance of ion channels, response haracteristics of membrane receptors, Cytoplasmic buffering , second – messenger systems , and protein expression as determine by gene transcription, translation, and postranslational modi ficaiton. Mechanisms extrinsic to the neuron include changes in the amount or type of neuro trans mitters present at the synapse, modulation of receptors by extracellular ions and other moldecules, and temporal and spatial properties of both synaptic and nonsynaptic input.

Nonneural Cells, such as astrocytes and oligodendrocytes, have an important role in many of these mechanisms as well Certain known Causes of seizures are explained by these mechaninsm. For example, accidental ingestion of domic acid, which is an analogue of glutamate (the prineipal exeitatory neurotransmitter in the brain), Causes profound seizures via dircet activation of excitatory amino acid receptors throughut the CNS. Penicillin, which can lower the seizure threshold in humans and is a potent convulsant in experimental models, reduces inhibition by antagonizing the effect of GABA at its receptor, The basic mechanism of other precipitating factors of seizure,s , such as sleep deprivartion, fever , alcohol with drawal, hypoxia, and infection are not as well understood but presumably involve analogous perturbations in neuronal excitability similarly, the endogenous factors that determine an individual's seizure threshold may relate to these properties as well. Knowledge of the mechanisms responsible for the initiation and propagation of most generalized seizures (including tonic – clonic, myoclonic, and atonic types) remains rudimentary and reflects the limited understanding of the connectivity of the brain at a systems level. Much more is understood about the origin of generalized spike – and – wave discharges in absence seizures. These appear to be related to oscillatory rhythms that are normally generated during sleep by cirecuits

Connecting the thalamus and Cortex. This oscillatory behavior involves an interaction between GABAB receptors, T-type Ca^{++} channels , and k^{+} channels located within the thalamus. Pharmacologic studies indicate that modulation of these receptor and channels can induce absence seizures, and there is speculation that the genetic forms of absence epilepsys may be associated with mutations of component of this system. Mechanisms of Epileptogenesis: Epileptogenesis refer to the transformation of a normal neuronal network in to one that is chronically hyperxcitable. For example, there is often a delay of month to years betwenn an initial CNS injury such as trauma, sroke , or infection and the first seizure. The injury appears to initiate a process that gradually lowers the seizure threshold in the affected region until a spontaneuous seizure occurs. In many genetic and idiopathic forms of epilepsy, epileptogenesis is presumably determined by developmentally regulated events. Pathologic studies of the hippocampus from patients with temporal lobe epilepsy have led to the suggestion that some forms of epileptogenesis are related to structural changes in neuronal networks. For example many patients with MTLE syndrome have a highly selective loss of neurons that has been proposed to contribute to inhibition of the main excitatory neurons within the dentate gyrus. There is also evidence that , in response to the loss of neurons, there is recognization or

sprouting of surviving neurons in a way that affect the excitability of the network. Some of these changes Can be seen in experimental models of prolonged electrical seizures or traumatic brain injury. Thus, an initial injury such as head injury lead to a very focal, confined region of structural change that causes local hyperexcitability. The local hyperexcitability lead to further structural changes that evolve over time unitl the focal lesion produces clinically evident seizures. Similar models have also provided strong evidence for long – term alteration in interinsic , biochemical properties of cells within the netowk, such as chronic changes in glutamate receptor function.

Role of Inhibition in SEIZURE: There is presently good evidence of a variety of powerful inhibitory systems. Negative feedback circuits act upon motor neurons in the spinal cord. In the cerebellum, there is evidence of inhibitory actions of the basket cells, outer stellate Cells, Golgi cells, and purkinge cells , whreas excitatory function are left to the granular Cells. Further negative feed back mechanisms have been demons trated in hippo campic basket cells acting upon pyramidal cells, in the thalamus, and at the neocortical level,

Special Actions of Inhibition: A ring of inhibitory action surrounds small penicillin – induced foci of cortical epileptic activity (Surround

inhibition). Vertical inhibiont has been found to play an important role in the prevention of descending paroxysmal neuronal activity in to the spinal Corde The terminatoion of a major epileptic seizure has been ascribed to the depletion of metabolic supplies and increasing hypoxia. An active type of inhibiton in seizure termination has been postulated. Cortical norepinephrine strongly increasses with the termination of epileptic firing. Inhibitory structures involved in seizure termination are thought to be located in the cerebellum Ablation of the cerebellum intensifies seizure activity in the animal. This concept has prompted the introduction of cerebellr stimulation for the therapy of recalcitrant seizure disorders in the human. According to Velasco et al seizure termination could also be of a cerebral Cortical nature. This view is based on the observation of pentylenetetrazol – induced seizures in cats with brain stem transection at the mesen cephalic Level.

Are there epileptic seizures of inhibitory character? Somatic inhibitory seizures (ictal paralysis) i.e.a transient hemiplegia due to contralateral ictal discharges, have been a controversial issue. By CONTRAST , Todd paralysis is a post ietal phenomenon Consisting of hemiplegic or hemiparetic deficits in the wake of a hemiconvulsive attack. The studies have outlined the epileptogenic role of inhibitory systems in petitmal

absences in the human, and their effective treatment by antiepileptic drugs with special effect on inhibitory pathways.

Genetics and Epilepsy

Mendelian Disroders Involving seizures:

Progressive myoclonus epilepsy: Norio et al reviewed the data for 74 Fininish families with progressive myoclonus epilepsy and calculated the risk for siblings for probands to be 26% , an excelent fit to the hypothesis of autosomal recessive inheritance. Most affected members developed signs in the age range of 8 to 13 years, and there were no Lafora bodies in Cases coming to autopsy.

Benign neonatal familial convulsions: Benign neonatal familial convulsins from another epilepsy syndrome with a clear – cut pattern of inheritance . Bjerre and Corelius reported 14 family members in five generations who had frequent convulsions within the first few weeks

Of lifte. Vitamin B_6 dependency was exeluded, and there were no disturbances of electrolyte or glucose balance and no problems with amino aeid metabolism. There was no retardation and the out come was favourable. The prognosis in terms of subsequent neurologieal handicap

was exelent and the risk of subsequent epilepsy was low. The pattern of inhritance is compatible with an autosomal dominant trait.

Tuberous sclerosis and neurofibromatisis: These are autosomal dominant trait. Tuberous selerosis has been identified as an important Cause of infantile spasms.

Homocystinuria: Homocystinuria is an autosomal recessive metabolic disease with intcresting features. A deficiency of cystathionine B-synthase lead to inereased plasma homocysteine and methionine and decreased cysteine. The major complications are mental retardation dis locatin of the lens, skeletal abnormality and a tendency to thromboembolic episodes.

Myoclonic epilepsy with mitochondrial myopathy: myoclonic epilepsy was associated with mitochondrial myopathy in a large pedigree. Muscle biopsy of affected members showed an inereased number of abnormal mitochndria, but the myopathy could not be distinguished from other mitochndrial myopathies (all of which show ragged red fiberes). Cerebral dysfunction included prominent photic driving on EEGS and high – am plitude visual and somato sensory evoked responses . Autosomal dominant, autosomal recessive and X-linked recessive inheritance could be exeluded. Instead, the family pattern was Consistent with maternal inheritance, following the distribution of mitochondrial DNA that has been observed in

othert traits and should be considered in future studies of epilepsy.

Chromosomal Abnormality.

Down's syndrome: In general , down's syndrome seizures were milder than those of other retarded patients.

Alzheimer's disease: A brief note about Alzheimer's disease may be appropriate in view of the similarity of the pathology of this disease with that of older patients with Down's syndrome. In a recent study of patients with autopsy – Confirmed Alzheimer's desease 10% of patients demonstrated unprovoked seizures and 10% demonstrated myoclonus after the onset of Alzheimr's disease sysmptoms. The frequency of seizures was increased ten – fold over that expected based upon the age – specific incidence of seizures in the general population. This observation should not be surprising since disorders of grey matter are in general characterized by seizures. This may explanin in part the high frequency of seizures in older Down's syndrome patients, since most will develop pathological brain changes Consistent with Alzheimer's disease.

Ring chromosome 14: The diagnosis of tuberous sclerosis was at first entertained for an infant girl with mental retardation and seizures associated with scattered vitiliginous spots and multiple hyperpigmented spots. The presence of dysmorphic features of the head and face, however,

led to a chromosom study which showed a ring chromosome 14 These patients have generalized tonic clonic seizures and myoclonic jerks which were fully Controlled with antiepileptic treatment.

Inverted duplicated 15: A high frequency of seizures is found in patients with an extra inverted duplieated chromosome 15.

The Causes of Seizures

In practice, it is useful to consider the etiologies of seizures based on the age of the patient, as age is one of the most important factors determiniing both the incidence and likely Causes of seizures or epilepsy. During the neonatal period and early infancy, potential causes includes:

Hypoxic – ischemic encephalopathy, trauma, CNS infection, Congenital CNS abnormality and metabolic disorders. Babies born to mothers using neurotoxic drugs such as cocaine, heroin, or ethanol are susceptible to drug – withdrawal seizures in the first few days after delivery. Hypoglycemia and hypocalcemia, which can occur as secondary complications of perinatal injury, are also cause of seizure early after delivery. Seizures due to inborn errors of metabolism usually present once regular feeding begins, typically 2 to 3 days after birth. Pyridoxine (vitamine B_6) deficeincy , an important cause of neonatal seizures, can be effectively treated with

pyridoxine replacement. The idio pathic or inherited forms of benign neonatal Convulsions are also seen during this time period.

The most Common seizures arising in late infancy and early childhood are febrile seizures, which are seizures associated with fevers but without evidence of CNS infection or other defined causes. The overall prevalence is 3 t 5% and even higher in some parts of the world, such as Asia. Patients often have a fanily history of febrile seizures or epilepry. Febrile seizures usually occur between 3 months and 5 years of age and have a peak incidence bet ween 18 and 24 months. The typical scenario is a child who has a generalized , tonic – clonic seizure during a febrile llness in the setting of a common childhood infection such as otitis media, respiratory infection , or gastroenteritis. The seizure is likely to occur during the rising phase of temperature curve (i.e.during the first day) rather than well in to the course of illness.

A simple febrile seizure is a single, isolated event, brief, and symmetric in appearance. Complex febrile seizures have repeated activity, last> 15 min , or have focal features. Approximately one – third of patients with febrile seizures will have a recurrence, but < 10% have three or more episodes. Recurrences are much more likely when the febrile seizure occurs in the first year of life. Simple febrile seizures are not associated with an

increase in the risk of developing epilepsy, which complex febrile reizures have a risk of 2 to 5%; other risk factors including the presence of preexisting neurologic and afamily history of nonfebrile seizures.

Childhood marks the age at which many of the well – de fined epilepsy syndromes present. Some children who are otherwise normal develop idiopathic, generalized tonic – clonic seizures without other features that fit in to specific syndormes. Temporal lobe epilepsy usually presents in childhood and may be related to mesial temporal lobe sclerosis (as part of the MTLE syndorme) or other focal abnormality such as cortical dysgenesis. Other types of partial seizures, including those with secondary generalizatin, may be the relatively late manifestation of a developmental disorder , an acquired lesion such as head tranuma, CNS infection (especially viral encephalitis) , or very rarely a CNS tumor.

The period of adolescence and early adult hood is one of transition during which the idiopathic or genetically based epilepsy syndrome, including JME and juvenile absene epilepsy, become less common, while epilepsies secondary to acquired CNS lesions begin to predominated. Seizures that begin in patients in this age range may be associated with head trauma, CNS infection (including paraitic infections such as cysticercosis), brain tumors, Congenital CNS abnormalities, illicit drug use,

or alcohol withdrawal Head trauma is a common cause of epilepsy in adolescents and adults. The head injury Can be caused by a variety of mechanisms, and the likelihood of developing epilepsy is strongly correlated with the severity of the injury. Apatient with a penetrating head wound, depressed skull fracture, intracranial hemorrhage, or prolonged posttrau matic Coma or amnesia has a 40 to 50% risk of developing epilepsy, while a patient with a closed head injury and cerebral contusion has a 5 to 25% risk. Recurrent seizures usually develop within 1 year after head trauma, although interval of 10 years or longer are well known, In controlled studies, mild head injury, definedas a concussion with amnesia or loss of consciousness of < 30min, was not found to be associated with an increased likelihood of epilepsy. Nonetheless, most epilepto logists know of patients who have partial seizures within hours or days of a mild head injury and subsequently develop chronic seizures of the same type; such Cases may present rare examples of chronic epilepsy rsulting from mild head injury.

The causes of seizures in older adults include crebro vaseular disease, trauma (including subdural hematoma), CNS tumors, and degenerative diseases. Cerebrovas cular disease may account for approximately 50% of new cases of epilepsys in patients older than 65. Acute seizures(

i.e.occurring at the time of the stroke) are seen more often with embolic rather than hemorhgic or thrombotic stroke. Chronic seizures typically appear months to years after the initil event and are associated with all forms of stroke.

Metabolic disturbances such as electrolyte imbalance, hypo – or hperglycomia, renal failure, and hepatic failure may cause seizures at any age. Similarly, endocrine disoders, hematologic disorders, vasculitides, and many other systemic disease may Cause seizures over a broad age range. A wide variety of medications and abused substances are knoun to precipitate seizures as well include:

- Antimicrobials: Blactams – Quinolones – Acyclovir – Isoniazid - Gancilovir
- Anesthetics and Analgesics: Meperidine – Tramadol – local anesthetics
- Immunomodulatroy drugs: cyclosporine – Tacrolimus – Interferons
- Pyschotropics: Antidepressants – Antipsychotics – Lithium
- Radiographic Contrast agents
- Theophylline
- Sedative – hypnotic drug withdrawal : Alcohol – Barbiturates – Benzodiaze pines

- Drugs of abuse : Amphetamine – Cocaine – Phencyclidine – Methylphenidate
- Flumazenil

Pathology

Structural abnormality of individual neurones or, more frequently an alteration in their number and arrangement are observed in some epileptic lesions but, in many patients, non – neural elements dominate the morphological picture – for example, vaseular malformations, scars, glial neoplasms: pathologic structural abnormalitjes discussed below:

- Lesions originating during intra uterin life:

Heterotopia : Occasional neurons scattered in the subcortical white matter are a common finding of no significance. Large ectopic clusters of neurones and glia forming grey masses occur in two patterns: Laminar within the centrum ovale and nodular at angles of the lateral ventricles. Some people with heterotopias are free from any neurological disability Others have seizures and some degree of mental retardation. The Lesions are Commonly bilateral and roughly symmetrical. Cortical gyral pattern and lamination are usually normal.

However, cases also occur in which heterotopias are but one component of a complex cerebral maldevelopment.

Polymicrogyria: This distinctive lesion is characterized by many small gyrus – like formations without formed sulci. The surface of the involved brain presents rather wide gyri with wrinkled surfaces. The lesion may be fairly extensive and bilateral but, in adult, iso lated patches of this malformed Cortex are more commonly encountered. The opercula of the inslua are frequent sites of predilection. Cortical lamination is typically four- layered. Small foci of this lesion may be quite inconspicuous in surgically excised specimens. Neonates succumbing to Cytomegalovirus infection frequently show polymicrogyria in extreme degree. A range of nonspecific noxious events, e.g.coal gas poisoning, occurring at a critical stage of cortical maturation, usually in the fifth month of intrauterine life, can produce an identical lesion.

Polymicrogyria is, then , generally regarded as resulting from a disturbance of the orderly pattern of differentiation and migration of neuroblasts in to the cerebral mantle. An alternative point of view is that the four – layered cortical lamination is due to post – migratory destruction. This has received support from a serial section study of a

27 week fetus in whom the cell sparse zone of the polymicrogyric cortex. Was shown to be in continuity with layer 5 of the intact cortex. The outer cellular layer. May thus be formed by layers 2 , 3 and 4 and the inner cellular Leyer by layer 6. However, this post – migraional encephaloclastic Concept does not account for the abnormality of convolutional patterin. Poly microgyria may accompany othe major malformations.

Extensive, usually bilateral porencephaly was recorded by Dekaban in 11 patients with profound neurological deficits, including epilepsy, fields of polmicrogyric cortex lay adjacent to these pallial defects. Peach observed a four – layered cortex type of microgyria in 11 of 20 cases of Arnold – Chiari malformation.

Megalen cephaly: The term megalencephaly is properly applied only when the brain is large not hydro cephalic and storage diseases such as lipidosis have been rigorously excluded. It is not to be equated with the clinical descriptive term macrocephaly. Essentially, the cerebral cortex is unduly thick and hetero to pias are absent. Laurence reported a patient with unilateral involvement and persistent seizures leading to death at 5 months of age; both neurones and glia contributed to the enlarged hemisphere. In another unilateral example, Bignami et al

showed a three – fold inerease in neuronal nuclear volume and suggested hetero ploidy as the basic disorder.

Foeal cortical dysplasia: This lesion presents prominent his to pathological features. Lamination of the involved cortx is lost . Abnormally large neurones are scattered throughout the Cortex in a disorder ly fashion and may extend in small clusters in to the subjacent white matter. There is an overall reduction in neuronal population in the affected cortex which is charply demarcated from adjoining normal cortex. Astrocytes with abundant cytoplasm, lobulated or multiple nuclei, and fibre formation are frequent. These features are reminiscent of tuberous sclerosis , but Cortical nodularity , calcification, subependymal lesions and the cutaneous and visceral manifestations of tuberous sclerosis do not occur in patients with focal cortical dysplasia . A remarkable clinical feature reported by Taylor etal is the range of age at first seizure of from 2 to 31 Years. This latency is interesting in view of the undoubtedly intrauterin developmental origin of the lesion.

Tuberous sclerosis : Tuberous sclerosis is characterized by angiofibromas , seizures, and mental retardation, Hamartoma within the CNS include Cortical tubers (areas of haphazardly arranged neurons an large cells that express phenotypes intermediate between Lia and

neurons) and sub – ependymal hamartomas (large astrocytic and neuronal cell clusters beneath the ventricular surface, which may give rise to a tumor unique to tuberous sclerosis – subependymal gient cell astrocytoma. In addition, renal angiomyolipomas, retinal glial phakomas, pulmonary and Cardiac myomas, hepatic, renal, and pancreatic cysts. Leathery cutaeous thickening (shagreen patches); hypopigmented areas (ash leaf patches), and subungual fibromas may occur. There is variable expressivity and penetrance, and at least two distinct loci are known, on chromosomes 9 (hamartin) and 16 (tuberin).

Hamartoma: These lesions are tumour – like malformation. On microscopic examination, many bear a strong resemblance to neoplasms but they lack the property of progressive growth and expansion. Most hamartomas occur in the amygdaloid nucleus, medial occipi to – temporal (fusiform) gyrus or less frequently in the hippocampus. Occurrence in the frontal and parietal lobes has been recorded. Any Combination of astrocytes , oligodenrocy tes and neurons may occur. Calcification is frequent. Patients with a psychosis accompanying their epilepsy were statistically more likely to have a hamaroma than an atrophic temporal lobe lesion.

Meningio – angiomatosis: strictly this lesion should be considered under the above heading of hamartoma, for such it is. However, it is non – glial and predominantly composed of cellular elements which normally lie outside the pia mater. Meningio – aniomatosis is not to be Confused with examples of ultiple meningionas such as sometimes occur in VonRecklinghausen disease, nor with meningioma en plaque. In meingioma – angiomatosis a portion of cerebral Cortex is replaced by tissue having the structure of meningioma but lacking its propensity to grow. Large neuronsare scattered within the lesion. Woster et al established its association withcentral neuro fibroma tosis.

Neurocutaneous melanosis: This striking complex comprises a garment type pigmented lesion of the skin and an excessive accumulation of melanocytes in the lepto meninges. Additionally in some cases, melanin of both cutaneous and neuronal type is found in neurons, melanocytes and macrophages within certain brain structures. These include the amygdaloid nuclei and dentate nuclei of the cerebellum. The development of primary malignant intracranial melanomata bring these patients to the attention of pathologists.

Dermoid and epidermoid cysts: Epidermoid cysts are well – demarcated lesions that are amenable to complete surgical excision.

Post operative radiation therapy is unnecessary. Dermoid cysts are thought to arise from embryonic rests of skin tissue trapped within the CNS during closure of the neural tube. The most frequent locations are in the midline supratentorially or at the cerebellopontine angle. Histologically they are composed of all elements of the dermis in cluding epidermis, hair follicles, and sweat glands; they frequently calcify. Treatment is surgical excision.

Disorders of vascular organization: Disorders that concern us have are cavernous hemangioma, arteviovenous malformation and sturge – Weber disease. Cavernous hemangiomas are usually static lesions and are certainly not neoplastic despite their terminology. Composed essentially of endothelial lined channels with thick collagenous walls, they often have a surrounding zone of gliosed brain and scatered hemosidrin pigment. Calcification is Common. In Contrast, the shunting of arterial blood in to much altered venous channels in arteriovenous malformation produce a dynamic lesion with profound local, and occasionally stystemic, alterations in cerebral blood flow. Regional autoregulation of cerebral blood flow is lost. Fluctuating hypoxia of near by cortex may play a role in the genesis of seizures which occur so commonly in patients with this lesion. The well –

known triad of facial neevus flameus, seizures and intracerebral Calcification, which forms sturge – weber disease or encephalo facial angiomatosis. The extent of the pail venous angioma varies considerably; Cortical atrophy is often more extensive than the vaseular abnormality.

**** Lesions associated with childbirth:***

By long tradition, birth injury is believed to give rise to lesions causing habitual epilepsy. That prematurity, excessive moulding, precipitate delivery and neonatal asphyxia may give rise to intracranial lesions is not in dispute. Some lesions, such as subependymal cell – plate hemorhages with secondary ventricular rupture are not compatible with prolonged survival. Others, such as periventricualr leukomalacia and basal ganglia lesions are not associated with epilepsy. The early stages of laminar cortical necrosis in neonatal asphyxia is illustrated by Banker et al. The selective in vovlvement of the dept of sulci compared with the crowns of gyri is clear and consistent, but why this pattern should occur remain unknown. Ulegyria, often in the boundary zones of major cerebral arteries, can readily be visualized as evolving from these earlier stages by resorption of necrotic tissue and gliosis to form the

unmistakable mushroom – like gyri: Hypotension Complicating hypoxia is believed to determine the distribution of ulegyria in these cases. Large, well – defined, destructive lesions occurring in recognized arterial territories in the brains of patients with seizures and ofen with fixed neurological de ficits are readily. Recognized as old infarcts. The patients with temporal lobe epilepsys and homonymous hemianopai Reported by remilard et al undoubtedly belong in this category.

Lesions resulting from febrile illness of childhood:

Zimmerman described cortical nuronal necrosis, sometimes widespread occasionally laminr, and often most eveident in the walls and depths of sulci in 11 children (age range 5 month to 6 years) who died within 1 to 13 days of the onset of sever febrile convulsions. Destruction of neurons of sommer's Sector of the hippocampus was prominent in his cases. Cerebellar lesions occurred in some patients. Cortical lesions where not complete, tended to be laminar, with layer 3 most frequently involved. In flammatory lesions of meninges or brain were not present. Viewed retrospectively, patients with established temporal lobe epilepsy have a greater than normal probability of having had febrile convulsion in early life.

Inflammatory lesions: Established and essentially statics epileptogenic lesions may follow bacterial meningtis and cerebral abscess. In pyogenic meningitis microscopic changes comprise microglial infiltration and astrocytic hypertrophy which may be surmised to affect dendritic arborisations in these layers. Selective neuronal necrosis occur in some patients. Cerebral abscesses with their attendant granulation tissue, fibrosis and progressive surrounding zone of gliosed brain form potent epileptogenic foci Epilepsy occur in shorter latency in patients with a temporal site than in those with a frontal site. Seizures in children were more frequent and more resistent to antiepileptic drug therapy than in adults. Seizures are a prominent clinical feature of various form of encephalitis of known or suspected viral etiology. Of special intrest are those patients in whom epilepsia partialis continua or recurrent seizures with focal onset are accompanied by a slowly prograssive neurological deficit.

Clinically there is some resemblance to the syndrome of hemiconvulsions, hemiplegia and epilepsy that usually has an abrupt onset and is believed to result from vaseular occlusion in most instances, al though coxackie A9 viral infection causing focal vasculitis or encephalitis. Parasitic in festation of the brain in the form of

cysticercosis cerebri is generally limited to certain geographieal regions.

Lesions resulting from head injury: Convulsions occurring contralateral to severe head in jury have been observed since early times. The risk of epilepsy was greatly increased by acute intracranial hematoma, by early epilepsy and by depressed skull fructure.

Breach of the pial barrier and mechanical damage to the cortex are therefore important determinans of post traumatic epilepsy. Morphologically, the focal residual lesions of trauma comprise saucer – shaped defects with smoothly scalloped borders, occurring most frequently on the crests of the orbital frontal and lateral tem poral gyri. The superficial or all Cortical layers are destroyed; a varible amount of collagenous fibrosis intermingled with glial proliferation forms a mening ocerebral cicatrix. A narrow bordering zone of partially de populated cortex is usual. It may be postulated that these predominantly subcortical abnormality cause partial deafferentation of the cortex and predispose to the development of post – traumatic epilepsy. The role of possible subcortical damage in the 33% of patients whose seizures were non ameliorated by cortical excision remains speculative.

Acquired vascular lesions of adults: The importance of occlusive cerebrovascular disease in the genesis of epilepsy in the population as a whole is heavily age dependent. In patients with onset of seizures after age 40 , the proportion attributed to cerebrovascular disease rose to 44.5%.

Neoplasms: Almost any supratentorial intracranial tumor can cause brain changes giving rise to seizures. Proximity to the Rolandic motor strip or more generally a frontal situation increases the probability of seizures. Chronicity of the lesion is a major factor in epilepogenicity. Small indolent gliomas with seizures as their sole clinical manifestation are sometimes distinguished with defficulty if at all from glial hamartomas:

Subtle dendritic lesions: There was a constellation of dendriic changes in the hippocampal neurones of patients with temprol lobe epilepsy. Loss of dendritic spines, nodularity of the dendritic shaft and fusiform swelling of apical dendrites occurred in a patchy fachion in neurons of pyramidal cell layer. Changes in the neurons of gyrus dentatus were less consistent but included a wind swept appearance. Of dendrites and narrowing of the dendritic field giving a closed parasol appearance. These changes were not thought to result from

deafferentation or remote anoxie injury; in only 50% of the patients reported was there a history of difficult birth or febrile convulsion in childhood.

Endogenous metabolic encephalopathies:In born errors of metabolism give rise to seizures. For example tay sachs disease, GM 2 gangliosidosis and hexosaminidase deficiency and others such as neuronal ceroid – lip of unscinosis. Clinical manifestatin s of many endogenous metabolic encephalopathies begin in childhood, but some are asymptomatic until well in to adult life for example : adult ceroid – lipofuscinosis or kufs disease . Lafora disease in which myoclonic and generalized seizures are prominent clinical features, may be diagnosed by cerebral biopsy and demons tration of chara cteristic neuronal inclusions.

Metabolic encephalopathies of extracerebral origin: persistent myoclonic gerks and occasional generalized seizures occur in some patients. Typically at autopsy there is laminar cortical necrosis with accentuation in sulcal depths.

Atrophic lesions of the Temporal lobe:

Neuronal loss and gliosis in the amygdaloid nucleus and uncus of the parahippocampal gyrus occur in a substantial proportion of the patient with temporal lobe epilepsy. Involve ment of the fusiform gyrus and the inferior and middle temporal gyri in about half the Cases with hippocampal sclerosis had been recorded . most cases of sclerotic temporal atrophy result from sever and / or recurrent febrile convulsions in early child hood that pre – existing cerebral damage from perinatal ashyxia inereases the risk.

Cerebellar lesions in epileptic patients:

These take the form of either a diffeus cortical atrophy with purkinje cell loss , gliosis of the molecular layer and sometimes granular cell layer involvement, or a rather well – Circumsribed lobular cerebellar sclerosis. This latter lesion is Commonly bilateral and in the posterolateral cerebellar hemispheres suggesting a border zone hypoxia – ischemia pathogenesis. Lobular cerebellar sclerosis is most often observed in institutionalized patients with severe seizures, making it tempting to assume that the lesion is the cumulative effect of ictal brain damage. While this may be so in some cases , the alternative view that

the cerebral epileptogenic foci and the cerebellar lesions both stem from a common episode of perinatal anoxia or febrile Convulsions (Such as cause ulegyria of watershed distribution) is more attractive . The concepts are not mutually exclusive. The purkinje and basket cells are known to be selectively vulnerable to hypoxia; boundary zone lesions occur either when there is an abrupt fall in blood pressure or sudden severe hypoxemia. Cerebellar lesions in epileptic patients were recognized before the introduction of phenytion and are probably not attributable to its use.

Radiology in epilepry

Plain Radiographs: Plain skull radiographs are completely negative in over 85% of intracranial tumours and in the presence of other significant pathology. Even abnormal appearances are frequently nonspecific and rarely adequate for management. Plain skull radiographs are not a use ful screeening test: any patient with epilepsy requiring radiological study should first be submitted to a plain CT scan. The use of CT increase positive finding from 30% to 55% and the number of tumours detected from 5% to 10% of cases investigated when Compared with all other studies, except, of course, NMR and is

therefore the best widely available screening test. Where the facilities exist, this approach is both logical and economical.

Nevertheless, plain films may be made prior to referral and may reveal significant abnormality which should be recognized. Also, skull radiographs may occasionally be useful for detailed study of bone for distinction between meningiome and other superficial intrinsic tumours shown on CT.

Raised intracranial pressure: On a good quality film there is an intact rim of cortical bone over the sella turciea in all normal Cases. Raised intracranial pressure causes erosion of the inner table of the skull, which is usually first recogrized by loss of part of the cortex of the sella, most frequently at the junciton of the posterior wall and floor. The incidence of erosion in patients with tumours remote from the sella varies, but it is present in over 25% reaching 44% in some studies,; about 20% of such patients do not have papilledema or other clinical evidence of raised intracranial pressure. Erosion of the tip of the dorsum Sellae may also occur, especially when a dilated third ventricle extends down in to contact; it should be noted that suprasellar tumours may cause a similar change.

Aqueduct stenosis, which may present with fits, in the Commonest cause of change in the sella Characteristic of chronic hydrocephalus with enlargement of the third ventricle. Shortening of the dorsum sella is often Combined with elongation of the anterior wall of the sella and sometimes with enlargement of the anterior clinoid processes in this Condition.

When intracranial hypertension has been present since before the age of 10 years the sutures may be wider than 2 mm or have elongated inter digitations. These changes are most reliably assessed on a basal projection on which the coronal and sagittal sutures are close to the film.

Physiological calcification: Calcification in the pineal body and / or habenular Commissure is visible on a lateral radiograph in about 60% of European adults; it is much less frequent in African and Asiatic races and in children. It is more difficlut to visualize on the antero posterior projection due to the relatively greater thickness of the frontal and occipital bones, but about 75% shown in the lateral view can be identified.

Deviation of more than 2.5 mm from the midline on a stright film is usually due to displacement by a contralateral mass and rarely to ipsilateral atrophy.

Calcification in the choroid plexus of the lateral ventricles is visible in about 10% of normal adults. It is usually in the trigone region, but can be else where and is not infrequently unilateral or asymetrical. Displacement Can be diagnosed definitely when the Calcification is outside the range of the normal curve of the choroid plexus around the thalamus.

Plaques of ossification commonly occur in the dura lining the vault, in the falx and the tentorium. Curvilinear or circular calcified opacities are frequent in the walls of the intra cavernous segments of the internal carotid artery in elderly patients.

The typical shape and position of these densities facilitates recogrition and distinction from significant lesions.

Pathological Calcification: This occur in mang conditions which may cause epilepry Frequently, calcification is not specific , but its appearance in a particular position may be diagnostic or it may be associated with other abnormalities making a diagnostic Combination. A dense ar tefact may be Caused by Substances such as EEG paste or

Lacquer on the scalp and may be recognied if it is projected partly outside the line of the vault on any of the radiographs.

Tumours: Calcification is visible in 10 15% of meningioma, sometines outlining a considerable part of the tumour. The appearance of the calcification , and the position if close to the dura, suggest the diagnosis, and hyperostosis at the tumour attachment or enlarged meningeal grooves leading up to it are Confirmatory. Calcification is visible in only 5.5% of gliomas being more frequent in the relatively bening tumours. Extent Varies from one or two tiny or large nodules to an irregular conglomeraion of nodules or an amorphous aggregate. The most typical appearance which occurs in both astrocytomas and the less common oligoclendrogliomas, is of one or more curvilinear streaks, duggesting gyri. Calcification in move aggressive gliomas suggests that malignant change has occurred in a more bening tumour. Hamar tomas, which are most common in the temporal lobe, may show non – specific calcification indistinguishable from a glioma prior to histology.

Tuberous sclerosis : The dysplastic lesions of tuberous sclerosis often progre ssively Calcify in older children, causing nodular and curvilinear densities. These are most frequment adjacent to the ventricular system and in the basal ganglia, though they may also occur

in other sites. Tubers may obstruct the ventricular sysem and cause hydrocephalus, but raisd inteacranial pressure is more often Caused by a giant cell astrocytoma or , less commonly , other types of glioma complicating the tuberous sclerosis. CT, which is not necessary as a routine in typical tuberous sclerosis, should be performed if a tumour is suspected. A family history typical skin manifestations or associated mental retardation has usually suggested the diagnosis. However, these features are some times absent and the disease may present with predominant manifestations in other systems. Mesodermal dysplasia may occur in any of the bones, but especially in those of the hands and feet which may show subperiosteal cysts or nodular cortical thickening and sclerotic areas, as well as pressure erosion from subungual fibromas. In a small number of patients the lungs are infiltrated by smooth muscle , which causes a honey comb appearance, spontaneous pneumothorax is a not infrequent complication of this Condition Multiple renal hamartomas, which are usually bilateral, may be shown by intravenous pyelography or computed tomography. Intestinal polyps have also been described.

Inflammatory disease: Non – specific calcification occurs occasionally in necrotic tissues such as old abscesses, and multiple

دانشگاه آزاد اسلامی
واحد پزشکی
کتابخانه مرکزی واحد پزشکی

nodules may be present in dead parasites. The history and examination will usually have suggested the diagnosis and the radiological finding are confirmatory. Combined linear cortical and curvilinear basal ganglia calcifications occur in about 40% of cases of congenital toxoplasmosis and are diagnostic in the clinical context. Hydrocephalus, due to occlusion of the acqueduct or outlets of the fourth uentricle, or microcephaly, secondary to destruction of brain substance, occur in about 50% of pafients. Cysticercosis maybe Confirmed by showing Calcified cysts in skeletal muscles. These are typically about 3mm in diameter and 12-15 mm in length and lie parallel to the axis of the muscle fibers. They may be recognized in cidentally in the neck and shoulder girdle muscles on films of the skull and chest, but are usually searched for in soft tissue films of the thighS. Calcification is much less frequent in cerebral cysts and is then usually confincd to the scoliosis, which show as nodules about 3 mm in diameter. Racemose cysticercimay obstruct the fourth or third ventricle and cause raised intra cranial pressure. Tuberculomas, which are the most Common in tra cranial masses presenting in India, may also show non specific nodular calcification. A Very rare but typical calcification , usually in the parietal regions, occurs in the walls of cysts in the cerbral form of

paragonamiasis. The disease in ednemic in the Far East and may be found in visitors from korea, china and Formosa.

Vascular lesions: Fine curvilinear or nodular calcifieaton is visible in about 15% of intracranial arterovenous malformations. It usually occurs in the walls of abnormal veins, forming large ring Shadows, but it can also be deposited within old hemorrhages. Meningeal arteries may Contribute to the blood supply of the malformation; enlargement of formina transmitting vessels and of vascular grooves and channels in the cranial vault may support the diagnosis. In the sturge- weber syndorme , characteristic sinous double lines of calcification are laid down in superficial layers of the atrophic cortex under lying the meningal angioma, which is usually in the occipital and posterior parietal regions. Calcification is visible on radiographs in only 50-60% of Cases; it may be seen as early as 18 month of age and tends to increase in density upto adultlife. The calcification is shown more frequently and earlier in life on computed tomograms.

New bone formation: Localized thickening of the inner table of the skull is commonly present at the site of attachment of a meningioma arising near bone. It is sometimes associated with selerosis of the adjacent diploe and less fre quently with bone formation on the outer

table of the skull. Enlarged and turtuous meningeal vascular channels extending to the hyperostosis and pits in the bone where small branches from the meningeal and scalp arteries perforate the vault to supply a tumour are useful Confirmatory signs. Diploic vascular channels may also be prominent, but it is difficult to assess their significance because of considerable normal variation. Bone reaction to solitary metastases from carcinoma of the prostate or breast may simulate a meningioma; extension of sclerosis in to the facial skeleton and evidence of metastases else where may be heplful in differential diagnosis.

Meningional – en – plaque typically produces a more diffuse and extensive scleroisis of bone, usually at the base, which could be confused with fibrous dysplasia. The latter condition is not a cause of epilepsy and would present an incidental finding. In its sclerotic form the bone is thickened and has a more homogeneous chalky density without trabecular structure.

Bone erosion:Meningioma may Cause isolated erosion much less frequently than sclerosis and hyper ostosis. The erosion is usually ill defined, more extensive on the inner aspect of the vault and is usually accom panied by enlarged meningeal channels, a Combination which strongly suggests the diagnosis. Metastases and the rare primary

tumours of bone commence within and more extensively destroy the diploe; they are an unusual cause of fits. Pressure from any subadjcent mass, duch as a superficial glioma, a meningioma or a porencephalic or arachnoid cyst, may Cause smooth Corticuted erosion of the inner table or localized expansion of the contiguous vault. Ceregral hypoplasia or atrophy: Because growth of the skull is secodary to that of the brain, which takes place mainly in the first two years of life, radiological findings are most marked when a lesion occurs early in this period. Lesser changes may be seen with severe damage occurring later but before puberty. With predominantly unilateral in volvement, the capacity of the skull over the smaller hemisphere or lobe is less than that of the corresponding normal region. This may be recognized by flattening of the Curve of the vault, elevation of the base with enlargement. Of the air cavities in the sinuses or mastoids and deviation of the falx or superior sagittal sinus towards the affected side. He skull overlying the atrophic lobe is usually thickened , but it may be thinned and smooth if there is a wide fluid – filled space between the atrophic lesion and the vault. CT has reduced the importancee of such secondary signs by assessing atrophic lesions more directly.

Post – traumatic epilepsy : Linear fractures, especially in young patients, usually heal without trace. In depressed fractures, deformity remains and occasionally bone frangments may be shown projecting medially from the edge and are commonly associated with scarring in the adjacent brain. When the dura is torn the fractare line may widen. In adults, this is associated with leptomeningeal syst formation, which may cause bevelled thinning of the overlying inner table extending beyond the limits of the fracture. In children, such erosion may also be due to herniated brain, often damaged with cystic change, as well as extracerebral cyst in direct contact with the bone. The cyst sometimes herniated through the fracture line and expands under the scalp, eroding the outer table Windening fractrures, especially in children, are usually associated with underlying brain damage. A mening ocerebral cicatrix may result in expansion of the ventricle or formation of an arachnoid cyst and, even in the absence of fracture, trauma, may cause sufficient Contusion and hemorrhage to induce formation of an intracerebral cyst. Any of these Condition may incite thining or lateral bulging of the adjacent inner table; in all of them the pathology is well shown by CT.

Chest Rdiographs: The importance of the lungs as a mirror of systemic disease need no emphasis and a chest radiograh is indicated in every patient with an intracranial mass.

Bronchial Carcinoma is by far the most Common tumour metastasizing to the brain. Cerebral metastases from other neoplasms are frequently associated with pulmonary metastases. Occasionally, unsuspected Cardiac lesions or chronic lung disease is first revealed on routine chest films.

Computed Tomography: On radiograhs it is only possible to recogrize four densities equivalent to bone or calcification, soft tissue or water, fat and air. CT gives quantitative readings of tissue density sufficiently sensitive to discriminate between the various intracranial tissues and to distinguish white and grey matter. The method requires that the patient lies Completely still for periods of between a few seconds and a minute, Variying with the type of machine, while a series of contiguous sections of the head are scanned through their edges from a large number of directions by a finely collimated beam of x-rays with a thickness of 1-13 mm.The intensity of the beam is measured before and after transmission through the head , and many readings are taken in each direction from different angles. A computer

assembles the data from each section and, using a mathematical method , reconstructs it as a matrix of cells (pixels) between 0.75 mm^2 and 1.5 mm^2. A digital value approximating to within 0.5% of the average radiation absorption within the tissues contained in the volume (voxel) represented by each particular pixel is printed out in a corresponding location.

Pathological findings: The incidence of CT scan abnormalities is markedley influenced by clinical selection. It is increased particularly by the presence of interictal focal signs and /or focal EEG abnormalities with slowing and spikes.A coarse approximation of the incidene of CT abnormalities inaccoding to unselected and partly selected case indude: Normal examinations or varing degress of diffuse atrophy will be found in between 65% and 85% , and focal atrophy, hemiatrophy or porencephaly in between 4% and 16%. In most series, neoplasm and infarct have an incidence of just under 5% , and angiomatous malformation or aneurism about 1.5% In general, surgically amenable lesions are rarely detected by CT in patients without neurological symptoms or signs after more than five year's duration of seizures. Though primary generalized epilepsy was associated with CT abnormality in 10% of Cases in two series. But other series , which fit

the general experience of these cases,, differ from matched control in only two respects. First, patients who had suffered episodes of status had a higher incidence of cerebral atrophy, and secondly , prolonged therapy with phenytin was occaionally associated with cerebellar cortical atrophy. In secondary generalized epilepsy atrophic changes are shown in CT in almost two – third of cases and an incidence of over 90% has been recorded. The incidence of CT abnormalities is high in simple partial seizures, ranging in different series between 52% and 68% , with tumours between 4% and 38%. It is also high in Complex partial Seizures, ranging between 40% and 70%. mesial temporal sclerosis is the most Common abnormality. It is caused by ischemia which may be precipitated by prolonged seizures and is usually manifested as temporal lobe atrophy with dilatation of temporal horn. Jabbari et al reported one Case with an arcuate non – enhancing region of Calcification on CT. Small focal tumours, including hamartomas, have formed up to 23% of lobectomized series. The age of onset of the epilepsy considerably in fluences the incidence and nature of the alonormalities shown; the incidence is highest with onset during the first year of life when if may reach 68% , with a high proportion due to Congenital malformations and perinatal brain demage. Focal seizures

after the first year and under 15 years of age are uncommonly due to tumour. CT infrequently reveals an abnormality of therapeutic significance, though, occasionally, low density changes in white matter or symmetrical calcification may suggest an unsuspected metabo lic disturbance. When epilepsy arises in adult life, the incidence of abnormality inereases with the age of onset. Under the age of 35 , head injury and neoplasm predominate; between 35 and 60 cerebral ischemia and neoplasm are dominant, with an increasing proportion of metastases; and after 55 , ischemia and degenerative disorders are most likely. Epilepsy follows in over 12% of severe head injuries but it is rare after more minor injuries . If CT does not reveal a focal lesion soon after injury , epilepsy is unlikely, with intracerebral hemorrhage the incidence is about one in six; if both intra and extracerebral hemorrhage are present there is about a 75% incidence of epilepsy. Atrophy and Hydro cephlus: Generalized atrophy, hemiatrophy, focal atrophy, Cortical and cerebellar atrophy, hydrocephallus and cystic expansion of the ventricles or subrachnoid space are all clearly shown. The more minor degrees of temporal atrophy associated with temporal sclerosis may be difficult to recognize, even with high resolution scanners.

They are better shown with MRI as are most midline stenosing lesions causing hydrocephalus. Vascular lesions :A typical infaret shows as a low attenuation region involving both, the white and cortical grey matter, sometimes wedge – shaped when in the distribution of a Cortical artery and without displacement of adjacent structures. In a recent in farct, however, edema may cause the lesion to appear ill defined and may produce swelling sufficient to suggest the possibility of a tumour . Repeat study may distinguish by showing a tendency of the infarct to resolve towards more typical appearances within a few days. The bloos – brain barrier is damaged by infarction and enhancement may occur until recovery has taken place, which is usually less than one nonth after the stroke but Can be up to ten weeks. Some times infarction is patchy and shows as multiple regions of decreased attenuation in the distribution of the occluded vessel. A n old infarct may eventually form a cyst, which cause a sharply defined region of low attenuation, or a scar, sassociated with focal atrophy. Amall vessel disease commonly causes patchy ill – defined low density in the deep white matter of the cerebral hemisphere, Sometimes associated with lacunar in farcts in the white matter and / or Copus striatum. The attenuation of clotted blood, which increases as serum is expressed

from the Contracting clot, is sufficiently characteristic for recognition of a recent hematoma.

Angiography is necesarg if details of a causative lesion need to be defined, but large aneurysms and angiomas Can be idenified by re-examination by CT after intravenous injection of Contrast medium. As a clot is absorbed, its density diminishes and eventually a cyst or scar, indistinguishable from an old infarct , may remain.

Tumous: Neoplasms cause mass effect of very variable degree , resulting in displacement and deformity of normal structures due to compression and / or invasion. The attenuation of tumour tissue varies markedly with the cellular structure; it may be higher, similar to or less dense than the adjacent brain. Calcified, hemorrhagic, cystic, necrotic and edematous regions in or adjacent to tumours may Cause superadded focal variation of the basic attenuatin due to the tumour tissue. Grade I and II glioma are mainly of diminished attenuation, apart from calcified foci which are often evident when they are not visible on radio graph. Higher grade gliomas tend tobe heterogenous, usually of diminished but with areas of similar or greater attenuation than the normal white matter, and over 90% enhance with intravenous contrast medium, Fluid in cyst and necrotic parts is common in malignant tumours; it may be

suspcted it there are low density non – enhancing regions, but can only be definitely diagnosed when there are fluid levels. The edges of gliomas are Commonly poorly demarcated although, occasionally, they maybe well defined. Metastases usually show as relatively well – defined masses which may Vary in density from less to greater than normal brain. Not uncommonly there is irregular central necrosis andthere may be extensive edema of the adjacent white matter. If a solitary lesion is revealed, re-examination after intravenous contrast injection may show further metastases and is especially important if surgery is contemplated.

Meningioma show as peripheral well – defined enhancing masses of greater attenuation in most instances, but sometimes isodense with brain. A ss ociated cerebral edema is not uncommon and, if the section does not pass through a small meningioma, the edema may be mistaken for a primary intrinsic pathology.

Developmental abnormalities: Dermoides , which may be recognized from the presence of fat which is less dense than water, rarely present with epilepsy; but epidermoids morefrequently do so when they encroach on the surfaces of the cerebral hemisphers. They are usually low density masses, without surrounding edema. There may

be some calcification and occasionally enhancement in the capsule. The more gross brain malformations , in which the ventricles show characteristic ana to mical deformities, are evident on both CT and MRI imaging Neuronal migration and proliferation abnormalities arising at a later time in development in which the brain substance itself may be mainly affected , are more exactly depicted by MRI but may be diagnosed by CT. They include heterotopia, in which nodules of graymatter may deform the lateral ventricular outline , expand within the white matter or thicken the cortex causing refractory seizures,and sometimes microcephaly. Lissen cephaly in which epilepsy is Combined with retardation and microcephaly , is charac terized by absence of part or all of the cerebral mantle so that the cortex appears smooth. The venticles are large, the subarachnoid space generally wide and the sylvian fissures shallow and wide. Recessively inherited microcephaly shows no abnormality on CT or MRI. The dysplastic lesions of tuberous sclerosis are usually evident by the second year of life and are most commonly associated with infantile spasms. The ty pical subependymal, partly calcified tubers, which do not enhance are most frequent.

Parenchymal and subcortical lesions may also be calcified , of low attenuation or less well defined. When these are solitary manifestations a definite CT diagnosis may not be possibel, but should be recogrized as consistent in the presence of clinical signs of tuberous sclerosis. Enhancing nodules in tuberous sclerosis are usually due to giant cell astrocytomals or occasionally to other types of glial tumours. The former are most commonly found in the regin of the formina of monro and tend to cause obstructive hydrocephalus. In sturge weber the subcortical calcification is shown earlier and is usually much more extensive than on skull radiographs. Abnormal enhancement occur in affected cortex and atrophy causes enlargment of the adjacent subarachnoid space and / or Ventricle.

Inflammatory dissease: Though a typical abscess is a clinical diagnosis , Corfirmed on CT by the presence of a relatively thin, even approximately isodense enhancing ring with a low density center and surrounding edema, it is an unusual cause of isolated epilepsy , However abtou one – third of abscess are atypical. These are often due to low grade organisms, some times in immune deficient patients, They tend to cause irregular , uneven ring or nodular enhancement on CT, with little or no central low density and relatively less edema.

Tuberculomas and other granulomas are usually isodense with brain, but may be of lower density. About 40% show some calcificatin, There is homogenous or irregular ring enhancement in the lesions and a variable amount of surrounding edema, but generally less than with acute inflammatory lesions. Convulsions are Commonly precipitated by Cysticerci within the brain parenchyma at the stage when they have died and provoked granuloma formation. Convulsions may Continue at a later stage also, when the larva has undrgone fibrosis and calcification, Hydatid cysts commonly present as slow – growing mass lesions , but convulsions occur in about 50% of cases, The CT finding are typical:

A large unilocular , well – defind mass of water density, without contrast enhance ment or adjacent edema unless the cyst has burst. Herpes encephalitis causes low density and brain swelling with predilection for the temporal lobes, which is usually evident on CT by the nd of the first week of the illness and at an earlier stage on MRI. Focal hemorrhagqic changes are not in frequent and patchy enhancement is usual. Early treatment may avoid the extensive brain damage which was frequently associated with considerable and rapidly progressive atrophy. In most other encephalitic illnesses , MRI is the

imaging modality of choice; though CT may show brain swelling, brain density often remains normal throughout the illness. Antenatal infection, with toxoplasma, cytomegalic inclusion virus , rubella or herpes simplex, causes necrosis of brain tissue , which may calcify , and atrophy leading to microcephly, retardation and epilepsy. Cytoegalic inelusion and less frequently, rubella cause linear calcification around the margins of the dilated ventricles. In to xo plasmosis similar changes may occur but more often there is nodular and curvilinerar calcification in brain substance. Necrosis in volving the a queduct may Cause hydrocephalus and surface lesions may be associated with subdural effustions resulting in micro crania. Care fully performed CT will detect some abnorma lity in about 98% of supra tentorial tumours, infarcts and intracerebral hemorrhages and in most atrophic lesions. In most Cases, the nature of the lesion can be suggested and in a considerable proportion its exact pathology can be predicted. In a recent analysis, 6.5% of Cases diagnosed as glioma on CT were proven to be benign; So when CT findings favour a malignancy their compatibility with a bening lesion should always be considered.

Magnetic Resonunce Imaging: In magnetic resonance, image production is by fourier transformation of spatially coded signals

produced by sensititve nucleons, which have been induced to resonate by the application of radiofrequncy pulses. Certain nucleons by virtue of their structure, possess a magnetic moment and will therefore gyrate around the axis of a strong external mangetic field with a frequency specific for each type of nucleon. Each gyrating nucleon produces an oscillatory magnetic field and therefore induces a radio signal. If the gyrating nucleons are brought in to phase by absorption of energy induced by th application of a shortexteranl radio signal at the same frequency as the gyrating nucleons, they will produce a recordable evanscent radio signal as they lose the energy and dephase. The energy is lost by the nucleons in realigning with the magnetic field and between each other during the dephasing process. The time taken for each of these processes has considerable in fluence on signal strength. They are referred to as relaxation times and designated T1 and T2 respectively. Signal strength is also particularly influenced by the number of sensitive nucleons, movement or flow of the nucleons within or through the magnetic field and the strength of the field. The method has some major advantages over computed tomography. 1. Ionizing radiation is not involved and , with field strengths of under 2 Tesla, the method appear to lack biological hazard. It can there fore be performed

when indicated and repeated as often as necessary on clinical criteria alone. Ferromagnetics implants or foreign bodies which could move in the high magnetic field, and certain types of pacemaker which are activated in the radio frequency field, are contraindieations.

2 . Each of the several parameters which infuence signal intensity on magnetic resonance images can be made the dominant factor reflected in the contrasting tissues in a particular image. Variations of pulse sequence produces a series of images in which differential contrast between normal brain and different pathological processes can be accentuated . Certain lesions commonly isodense with brain on CT and in a proportion of which CT has been completely normal, can be demonstrated by MRI; amongst these are demylinating diseases, encephalitis, including both direct infection, as in subacute sclerosing panencephalitis and post infective demyleination, ischemic lesions and low grade gliomas. In a recent study of 34 patients with complex partial seizures of more than 5 years duration, in which pre- and post – infusion CT scans were negative, MRI revealed focal structural temporal lobe lesions of potential surgical therapeutic significance in four Cases (11.7%); a cryptic arteriovenous malformation and a glioma were excised from two of these. The not uncommon declaration of a

progressive organic lesion on a follow up CT scan in patients with previously CT negative focal epilepsy also supports the view that MRI will provide a worthwhile positive yield in suchcases. Magnetic resonance imaging generally shows the pathological processes revealedby CT to be more extensive and differences in internal structure may be more clearly defined on some of the MR sequences. 3 The image plan in MRI, being determined electronically, is unrestricted by the mechanical constraints which influence computed tomography. For practical purposes, sagittal images can only be prduced on CT by computer reformatting of multiple thin sections made in an accessible plane, a process which is accompanied by loss of resolution and is also distorted by any patient movement; vertical plane images are particularly valuable in assessng the brainstem, high convexity and parasagital regions, relationship of abnormalities to the sylvian fissure and transcallosal extension of tumour. Multiple planar imaging is also useful for more exact volumetric assessment. 4. Bone – induced artefacts limit the value of CT, especially for the diagnosis of mall lesions adjacent to the skull base. The mode of acquisition of MRI and the lack of signal from Cortical bone has made it particularly valuable for detection of such lesions in the postevior fossa and adjacent to the

floor of the middle fossa. The very long T1 of normal cerebrospinal fluid can be used to delineate clearly the margins of the subarachnoid space and ventricles. The higher water content of the grey matter is associated with prolongation of T1 relative to that of white matter; grey matter therefore give a relatively lower signal when a shortpulse repetition time is used and the intensity in creases and eventually exentually exceeds that from white matter as the repetitiontime is increased. The clear delineation of the cerebrospinal spaces and of the white and graymatter facilitates localization of intra – axial, extra- axial and intraventricular masses. The change in signal induced by blood flow allows flow – dependent sequence to be formulated for visulaization of the major blood vessels, This is a further facility in aiding locatlization ofintra – and extra – axial masses and defining relationships of critical structurees. In general, the most significant information from MRI has been the anatomical distribution of pathology. Tissue specific charac terization is much less common, as migh t be expected , since in crease in water content in general causes prologation of the T1 and T2 relaxation time regardless of whether it is caused by edema infarction, encephalitis or demylination. The paramagnetic effects of iron in methmoglobin and of hemosiderin in

subacute and chronic hematomas and of melanin in melanoma metastases are manifested in short T1 relaxation; and triglyceride fat in lipomas and teratomas, as well as in subcutaneous and intermuscular fat planes, is also characerized by a very short T1 relaxatin time. The lack of signal from rapidly flowing blood with increasing signal with turbulence and slow flow clearly delineates and specifically characterizes aneurysms and angiomatous malformations and their connecting vessels uhen flow – dependent sequences are used. The lack of clear demarcation between some tumour margins and adjacent brain or surrounding edema has proved to be a limitation of MRI. This has been a feature of some metastases, infiltraing malignant gliomas, hemangioblastomas and meningiomas. Certain paramagnetic ions, of which gadolinium is Currently the most suitable, can be administered n biocompatible compounds such as DTPA which are, for practical considerations, retained within the normal blood brain barrier but penetrate the disrupted barrier in damaged brain tissue and through the permeable Capillaries of tumours and granulation tissue, in a very similar fashion to iodide Contrast media used in CT and technetium DTPA used in radionucleide studies.

The paramagntic agents shorten T1 relaxation time and thus enhance contrast on T1 weighted sequences; not only is the tumour demarcated but details of its structure tend to be better defined. Imaging in the coronal plane perpendicular to the long axis of the hippocampus and other variation in technique have improved the detection of hippocampal atrophy and gliosis, findings that are highly Correlated with merial temporal sclerosis and on epileptogenic temporal lobe. An even more sensitive measure of hippocampal atrophy is MRI measurement of the volume of the hippocampus. Hippocampal volume measurements in an individual patient then can be compared with those of normal Control subjects. Pomeranz believed that, patients with first time seizures or clinical manifestatins strongly suggestive of cerebral neoplasia will undergo both axial and coronal Sequences. Complex partial seizures are the most Common adult seizure type and most often occur in the temporal lobe. The utility of coronal sections in patients with refractory Complex partial epilepsy and the improved sensitivity of MR over CT in patients with first time seizures is becoming apparent. Approximately 50% to 75% of these patients have anatomic lesions , and 50% exhibit hippocampal sclerosis (mesial temporal sclerosis / gliosis) or temporal lobe atrophy/ hypo plasia. Correlation

between the severity of pathologic hippocampal sclerosis and the extent of signal alteration on MR is low. Occasionally, a small, calcified thrombosed AVM can escape MR detection. Approximately 10% of adults with this seizure subtype possess curable intracrainal lesions. A majority of pafients (65%) are cured of medically intractable partial seizures or improve following temporal lobe resection.

Loculated CSF, as within arachnoid cysts or porencephaly is distinguished by signal intensities close to those of the rest of the cerebrospinal fluid. The T1 relaxation time shortens when protein concentration is in creased as within cystic or necrotic regions of tumours, though it is still generally longer than that of the solid tissues.

Hemorrhagic changes are characterized by relatively shrot T1 relaxation times. Calcification gives no signal on MRI and may be suspected for this very reason on a combination of T1 and T2 weighted images. However, Calcification, hyperostosis and bone erosion are, in general better revealed by CT, at least in the supratentorial comparment. Currently, the relatively long acquisiton time of MRI imposes a limitation on its value for examination of restless and unco – operative patiets. If no abnormality is shown on computed tomography or magnetic resonance imaging, It is unlikely that other investigations will

show a significatin lesion in patients suffering from well controlled epilepsy and no other symptoms. The investigatin of late onset epilepsy is often an important clinical problem because of the possibility of underlying tumour yet full nearoradiological investigation is rigorous and often unrewarding. Although there are reservations about the value of scannng as a screeining test to exclude a lesion, it is often held in his particular instance that a normal scan, supported by a normal EEG may justify deferring exhaustive radilogical tests and awaiting clinical developments. Rapid sequence studies of intracranial masses may help to indicate the nature of the lesion.

AVM characteristically produces high activity in the early arterial phase. Meningiomas tend to show up earlier than tumours. Finally it shouldbe noted that cereral abscess can be shown and their progress under treatment followed by scans.

Types of Seizures

Classifications of epileptic seizures are concerned with classify – ing each individual seizure as a single event based on clinical and electroencephalographic (EEG) information. The classification of epileptic seizures is the 1981 revision of the Clinical and

Electroencephalographic Classification of Epileptic Seizures of the International League Against Epilepsy (hence – forth,, Internatinal Classification of Epileptic Seizures).

Seizures are first classified in to two broad cat egories: (a) partial seizures (seizures beginning in a relatively small location in the brain) and (b) generalized seizures (seizures that are bilaterally symmetric and without local onset). Seizures are then further classified by the exact clinical and EEG manifestations of the seizure. The clinical and EEG manifestations of the principal types of epileptic seizures.

International Classification of Epileptic Seizures

I. partial (focal, local) seizures

A. Simple partial seizures (consciousness not impaired)

1 . With motor signs.

2 . With sensory symptoms

3 . With autonomic symptoms or signs

4 . With psychic symptoms

B. Complex partial seizures (temporal lobe or psychomotor Seizures; consciousness impaired)

1 . Simple partial onset, followed by impairment of consciousness

a. With simple partial features (A.1-A.4), followed by Impaired consciousness

b.With automatisms

2. With impairment of consciousness at onset

a. With impairment of consciousness only

b. With automatisms

C. Partial seizures evolving to secondarily generalized seizures (tonic – clonic, tonic or clonic)

1 . Simple partial seizures (A) evolving to generalized seizures

2 . Complex partial seizures (B) evolving to generalized seizures

3 . Simple partial seizures evolving to complex partial seizures, evolving to generalized seizures

II. Generalized seizures (convulsive or nonconvulsive)

A. Absence (petit mal) seizures

B. Myoclonic seizures

C. Tonic seizures

D. Atonic seizures

E. Clonic seizures

F. Tonic – clonic (grand mal) seizures

III. Unclassified epileptic seizures (caused by incomplete data)

I. PARTIAL (FOCAL, LOCAL) SEIZURES

A. Simple Partial (Focal) Seizures

Definitions

Simple partial seiures are caused by a local cortical discharge that results in seizure symptoms appropriate to the function of the discharging area of brain, without impairmen of consicousness. Simple partial seizures may consist of motor, sensory, autonomic, or psychic symptoms and signs. The same symptoms and signs may occur in both simple partial seizures and complex prtial seizures (CPSs). The crucial distinction is that impairment of consciousness occurs in the latter, but not in the former. Impaired consciousness is defined as the inability to respond normally to exogenous stimuli by virtue of altered awareness or responsive ness. Responsiueness refers to the ability of the patient to carry out simple commands or willed movements, and awareness refers to the patient's contact with and recall of events during the period in question.

Seizure Phenomena

Seizure manifestations are dependent on the region of the cortex in which they originate and its functions. Following the Interna tional Classification of Epileptic Seizures, the manifiestations of simple partial

seizures can be divided into four groups: (a) with motor signs; (b) with somatosensory or special sensory symptoms; (c) with autonomic symptoms or signs; and (d) with psychic symptoms.

A.SIMPLE PARTIAL SEIZURES WITH MOTOR SIGNS. These are among the most frequently encountered varietis of simple partial seizure. The symptoms are, at least initially, always strictly contralat eral to the hemispheric focus and may represent the expression of excitatory (positive – irritative) phenomena, inhibitory (negative suppressive or paralytic) phenomena, or a combination of the two.

The simplest form of simple partial seizure with motor signs is clonus, which consists of rhythmic alternating contractin and relaxation of muscle groups controlled by the precentral gyrus. The episodes may be self-limited (clonic focal seizure), recurrent (focal motor status epilepticus), or continuous (epilepsia partialis continua). Spread of the discharge along contiguous areas of the precentral gyrus gives rise to the characteristic march of spreading involvement of muscle groups in jacksonian seizures. Transient paralytic phenomena (Todd's paralysis) are a common postictal manifestation of an excitatory clonic seizure, especially if it is severe or repeated. With somatic inhibiory seizures, sensory loss or dysesthesia and weakness occur.

Versive seizures consist of conjugate eye movements and turning of the head to the same side. Parietal and temporal lobe seizures may produce homolateral or contralateral versive movements, and occipital seizures usually produce contralateral versive movements.

Postural seizures consist of asymmetric dystonic posturing of the limbs, which may be associated with vocalization or speech arrest.

Aphasic seizures consist primarily of speech arrest or inability to verbalize while consciousness is fully retained, or both. Aphemia (speech arrest), as well as vocalization (phonatory seizures), may also occur.

B. SIMPLE PARTIAL SEIZURES WITH SOMATOSENSORY OR SPECIAL SEN SORY SYMPTOMS. Somatosensory seizures are usually described as numbness, "tingling", "pins and needles," or "like a weak electric shock" and may arise from the postcentral (most often) or precentral areas. Less frequently, a sense of movement, desire to move, or inability to move is present. The initial somatosensory sensation may be the only manifestation of a seizure. The focal discharge may spread to the adjacent sensory cortex, producing a jacksonian march of sensory phenomena. The focal discharge alsomay spread to the adjacent motor cortex, producing motor symptoms.

Visual seizures beginningwith simple visual symptoms are indicative of a focus in the occipital lobe. Visual simple partial seizures consisting of crude positive symptoms, such as flashes of lights or colors in the contralateral hemifield, are more frequently described than negative symptoms, such as scotomas or hemiano pia. Visual illusions (distortions of visual input) usully represent seizure phenomena arising from the posterior temporal area.

Auditory seizues arising near the cortex of Heschl's region of the first temporal gyrus may produce simple auditory phenomena usually described as a "humming", "buzzing", or "hissing". More complex auditory illusions or hallucinations result from discharges arising in the auditory association areas of the emporal lobe.

Olfactory and gustatory seizures consist of olfactory and guststory illusions or hallucinations, usually in the form of unpleasant odors and tastes.

Vertiginous seizures may consist only of a vague feeling of dizziness or lightheadedness. Vertiginous sensations without alteration of consciousness are extremely frequent expressions of vestibular iritative phenomena (peripheral or central), although they have been described also as true

epileptic manifestations of seizure foci in the middle or posterior portion of the first temporal gyrus (tornado epilepsy).

C.SIMPLE PARTIAL SEIZURES WITH AUTONOMIC SYMPTOMS OR SIGNS. Autonomic symptoms accompanying simple partial seizures may consist of epigastric sensation, flushing or pallor, sweating, pupil dilation, diaphoresis, piloerection, nausea, vomiting, borborygmi, or incontinence.

D.SIMPLE PARTIAL SEIZURES WITH PSYCHIC SYMPTOMS. Psychic symptoms of simple partial seizures may include dysphasia, dysmnesia, cognitive symproms, affective symptoms, illusions, or structured hallucinations.

Dysphasic symptoms may take the form of speech arrest, vocal ization, or palilalia (involuntary repetition of a syllable or phrase).

Dysmnesic symptoms, distortions of memory, may take the form of a temporal disorientation, a dreamy state, a flashback, the sen sation that an experience has occurred before (deja uu, if visual; deja entendu, if auditory), or the sensation that a familiar sensation is new (jamais vu, if visual; jamais entendu, if auditory). Occasionally, a patient may experience a rapid recollection of episodes from the past (panoramic vision).

Cognitive symptoms may include dreamy states, distortions of time sense, and sensations of unreality, detachment, or depersonalization.

Affective symptoms may include fear, pleasure, displeasure, depression, rage , anger, irritability, elation, and eroticism, Some individuals may have inappropriate affective reactions to environmental stimuli, possibly because of misinterpretation of cues during the clouded consciouness of a seizure. Fear is the most frequent affective sysmptom and may be accompanied by objective signs of autonomic activity suchas pupil dilatin, pallor, flushing, piloerection, palpitation, and hypertension.

Unlike the affective symptoms of psychiatric disease, the symptoms of partial seizures occur in attacks lasting a few minutes, tend tobe unprovoked by environmental stimuli, and usually abate rapidly. Less commonly, patients describe exhilaration, elation, serenity, satisfaction, and pleasure (ecstatic seizure, Dostoyevsky epilepsy). The enjoyable sensations may be similar to ordifferent form sexual pleasure. Sexual pleasure during an aura may consist of either sexual arousal or orgasm. Violent affect and behavior during partial seizures are disussed later.

Illusions are distorted perceptions in which objects are perceived as deformed. Polyopic illusions, such as monocular diplopia, macropsia, micropsia, and distortions of distance, may occur. Distortions of sound,

including microacusia and macroacusia, may be experienced. Depersonalization, a feeling that the person is outside the body, may occur. The patient may experience altered perception of the size or weight of a limb.

Structural hallucinations are perceptions without corresponding external stimuli and may affect somatosensory, visual, auditory, olfactory, or gustatory senses. Seizures arising from primary receptive areas tend to give rather primitive hallucinations, whereas seizures arising from association areas tend togive more elaborate symptoms.

E.COMPLEX PARTIAL SEIZURES WITH SIMPLE PARTIAL ONSET. If a simple partial seizure arising in a circumscribed portion of one lobe spreads to involve larger portions of the brain, and if consciousness becomes impaired, the seizure is classified as a CPS with simple partial onset.

F.SIMPLE. PARTIAL SEIZURES EVOLVING TO SECONDARILY GENERAL IZED SEIZURES. Simple partial onset seizures may spread further and become secondarily generalized (tonic – clonic, tonic, or clonic).

EEG Phenomena

A.INTERICTAL EEG. Abnormal interictal EEGs are found in as many as 80% to 90% of patients with simple partial seizures when multiple EEGs (including long – term monitoring) are performed and all types of abnormalities are considered. Only 50% or fewer of individual routine interictal EEGs show an abnormality. Focal spike or sharp discharges, slowing,or suppression of normal background are the usual abnormalities. Focal EEG findings are absent in many patients for several reasons: (a) spikes are an intermittent phenomenon; (b) spikes or slow waves originating from small areas of cortex may be markedly attenuated at the scalp; and (c) spikes or slow waves may originate from cortical areas distant from the convexity and be unrecorded at the scapl. Additional routine recordings, slepp deprivation, and long – term EEG recording increase the yield of abnormal EEG findings ina patient with a normal initial EEG.

B.ICTAL EEG. At the time of onset of clinical seizures, a majority of patients with focal seizures show a transformation in the scalp EEG from an interictal pattern to a sustained rhythmic pattern. The initial frequency of rhythmic ictal transformation (RIT) is most often in the range of 13 to 30 Hz but may be slower. The RIT shows a progressive increase in amplitude

and a decrease in frequency as clinical seizures develop. Spread to adjacent areas of the brain is indicated by the development of RIT in those areas. Termination of rhythmic ictal activity may be associated with the gradual development of slow – wave and spike – slow – wave activity that gradually decreases in frequency and then gives way to postictal slowing, depression of voltage, or both. Rhythmic ictal activity can also subside abruptly. In the minority of cases that show no RIT, the interictal pattenr of mixed sharp and slow activity (or normal background) persists without observable change during the clinical seizure.

Differential Diagnosis

Simple partial seizures in aduls must be differentiated from migraine, syncope, transient ischmemic attacks, Meniere's disease, and psychogenci seizures. In children, tics, chorea, and tremor sometimes cause diagnostic confusion.

Epilepsy Types, Epilepsy Syndromes, and Cerebral Localization

Simple partial seizure usually occur as part of localization related / symptomatic epilepsy. Within this epilepsy are four epilepsy syndromes named for the presumed location of onset: temporal lobe, frontal lobe, parietal lober, and occipital lobe.

B.Complex Partial Seizures (Psychomotor or Temporal Lobe Seizures)

Definitions

The central feature of CPSs is impairment of consciousness. Impairment of consciousness is defined as the inability to respond normally to exogenous stimuli by virte of altered awareness or responsiveness. Responsiueness refers to the ability of the patient to carry out simple commands or willed movemnt, and awareness refers to the patient's contact with events during the period in question and its recall.

The period of impairment of consciousness may or may not be preceded by symptoms or signs of a simple partial seizure. No other manifestations may appear during the period of impaired consciousness, or automatimsms (i.e.. nonreflex actions performed "automatically," without conscious volition, and for which the patient has no recollection) may be present.

Seizure Phenomena

A.CLASSIFICATION. The Internatinal Classification of Epileptic Sizeures divides CPSs in to four groups : (a) CPSs with simple partial onset followed by impairment of conscious ness only; (b) CPSs with simple

partial onset followed by impaired consciousness and automatisms; (c) CPSs with impair ment of consciousness at onset with impairment of consciousness only; and (d) CPSs with impairment of consciousness at onset with automatisms. Three major areas describe seizure phenomena during CPSs : (a) impairment of consciousness; (b) types of simple partial onset; and (C) automatisms.

B.IMPAIRMENT OF CONSCIOUSNESS. During the period of impared consciousness, a patient may look vacant or frightened . Although sometimes able to recount vague sensatins, thee patients do not realize that anything more has occurred.

C.TYPES OF SIMPLE PARTIAL ONSET. Simple partial onset, with motor signs, with somatosensory or special sensory symptoms, with autonomic symptoms or signs, and with psychic symptoms are discussed earlier, Psychic symptoms can occur without impairment of consciousness as part of a simple partial seizure. More commonly, psychic symptoms occur in association with impaired consciousness as part of a CPS. The frequent association of psychic symptoms and motor automatisms with CPSs is respon sible for the formerly used term psychomotor seizure.

D.AUTOMATISMS. An automatism is a more – or – less coordinated, involuntary motor activity occurring during the state of clouding of

consciousness either in the course of, or after, an epileptic seizure, usually followed by amnesia of the event. The automatism may be simply a continuation of an activity that was going on when the seizure occurred, or it may be a new activity developed in association with the ictal impairment of consciousness. Usually the activity is commonplace in nature, often provoked by the subject's environment or by sensations during the seizure; fragmentary, primitive, infantile , or antisocial behavior is occasionally seen. Automatisms can be detected in more than 90% of CPSs recorded on videotape.

Five types of phenomena may occur during an automatism: alimentary, mimetic, gestural, ambulatory, and verbal. Alimentary phenomena include automatic chewing movement, increased salivation, and borborygmus. Mimetic phenomena include movements of the face resulting in expressions of fear, bewilderment , discomfort, or vacant tranquility; laughing (gelastic seizures); and crying (lacrimonic seizures). Gestural phenomena include repetitive movements of the hands and fingers and sexual gestrures. Ambulatory phenomena include wandering or running (cursive seizures), and the patient may unknowingly run out in to traffic or in to obstacles. Verbal phenomena include short phrases, expletives, or

swearing, commonly repeated in an automatic fashion. The spontaneously vocalized words may reflect a previous experience.

E.DROP ATTACKS. Sudden loss of consciousness, accompanied by loss of postural tone and falls, may occur during a CPS. Such patients usually have had seizures for several years before the falls begin, suggesting an increasing rate of spread over time.

F.COMPOUND FORMS OF COMPLEX PARIAL SEIZURES. Most CPSs exhibit a combination of the symptoms listed earlier. Delgado Escueta et . al found that most CPSs were compound forms of two types.

During the early phase of a type I attack, the patient was essentially motionless and initially unresponsive to superficial and deep pain. After approximately 10 seconds, a second phase of 10 to 60 seconds' duration was observed. During this time, the patient remained unresponsive and showed automatisms such as repeated chewing, blinking, and swalllowing. During the third and longest phase of a type I seizure (0.5 to 12.0 minutes), impairment of consciousness of a less profound nature was observed. Automatisms could be interrupted, and the patient sometimes reacted to environmental cues. This phase is best described as a cloudy state.

Type II attacks consisted of reactive automatisms during impaired consciousness. A motionless, staring state was not observed, although

stereotyped movements occurred. Automatisms occurring during the cloudy stated of type II attacks and during the third phase of type I attacks were considered reactive, because the behavoior appeared purposeful. Amnesia for the entire attack ensued. Motor responses were coordinated and were sufficient to carry out the patient's intended actions; appropriate and inappropriate responses were both seen.

G.COMPLEX PARIAL SEIZURES EVOLVING TO GENERALIZED SEIZURES. The seizure discharges of CPS may become secondarily genreralized, producing a generalized seizure (tonic – clonic, tonic or clonic);

H.COMPLEX PARTIAL SEIZURES STATUS EPILEPTICUS.

EEG Phenomena

A. INTERICTAL. Interictal manifestations of CPSs include focal spikes, sharp waves, and slowing. These abnormalities most often are found in the anterior temporal regin , but many occur in other areas. Abnormalities may be localized or bilateral (synchronous or asynchronous). Discharges arising from the mesial surface of the frontal lobe may appear as generalized discharges on surface EEG.

B. ICTAL EEG. During a clinical CPS, any of the following can be recorded from scalp EEG electrodes: (a) sustained rhythm of spikes or sharp waves and rhythmic slowing; (b) attenuation of amplitude (suppression); (c) rhythmic slow waves; (d) 10 – to 30 – Hz fast activity; (e) spike – wave complexes; (F) other changes or variants of these five; or (g) no change (10% to 30% of patients).

These patterns may be focal, lateralized, bilateral, or diffuse.

C.POSTICTAL EEG. The postictal EEG usually consists of gener alized or localized slow activity. Lacalized postictal slowin provides information about lateralization or localization of the site of origin of the CPS in approximately 40% of recordings.

C. SPECIAL EEG TECHNIQUES. Approximately 50% of routine EEGs performed on patients with CPSs are abnormal. This yield can be increased to 90% using repeated studies, sleep deprivation (allowing 4 hours or less sleep the night before study), additional temproal electrodes (usually T1 and T2; alternatively, sphenoidal electrodes), and long – term EEG monitoring. When CPSs are suspected clinically and a routine EEG is normal, a sleep- deprived EEG with temporal leads should be ordered. If this is normal, long – term EEG monitoring should be considered.

Neurobehauioral Aspects of Complex Partial Seizures

Patiens with CPSs often have (a) damage to limbic structures (with resulting cognitive and behavioral problems), (b) seizures involving limbic structures, and (c) psychosocial difficulties caused by (a) and (b). Thus, a number of complex neurobehavioral issues are associatedwith CPSs.

A.EMOTIONAL ACTIVATION OF COMPLEX PARTIAL SEIZURES. Patients with CPSs are vulnerable to emotional activation of seizue activity because the anatomic structures involved during CPSs are those that subserve normal emotional responses. Conversely, reducing emotional stress (which may happen during hospitalization) may decrease the occurrence of CPSs.

B. INTERICTAL PERSONALTTY. Several authors hve described "an intrrictal personality" of patients with CPSs, characterized by such features as "stickiness," humorlessness, dependence, obses sionalism, circumstantiality, philosphic interests, religiosity, andger, personalized significance attached to trivial events, hypergraphia, altered sexual interest (hyposexuality or hypersexuality), and emotionality.

Some patients with CPSs do exhibit these traits. More studies are needed, however, to determine the prevalence of these traits in nonselected patients, their specificity for CPSs, and the pathophys iology and

psychodynamics of the traits. Pharmacologic or surgical control of seizures does not alter these personality traits.

C. VIOLEVT BEHAIOR. Attempts to restrain a patient who has clouded sensorium during or after a tonic – clonic seizure or CPSs may result in defensive and aggressive behavior. Well – organized, unprovoked, directed acts of violence are rarely a manifestation of epilepsy, however. Episodic dyscontrol syndrome (rage attacks) in not aform of CPS.

D. MEMORY LOSS. Poor memory and memory loss are frequent Complaints of the patient with CPSs. Short – term memory loss and subjective difficulty with memory have been attributed to hippocampal dysfunctin in temporal lobe epilepsy. A major abnormality found on formal psychometric testing is poor performance on con frontation – naming tests in patients with CPSs and a left – temporal EEG focus. This anomia, in turn, may result in impairment on many verbal subtests of intelligence and memory.

E. PSYCHOSIS. A psychosis resembling paranoid schizophrenia has been noted in some patients with CPSs. Some have reported, and some have denied, that the psychosis of CPSs can be differen tiated

from schizophrenia because patients with CPSs retain more affect and are less socially isolated than are patients with schizophrenia.

F. EPISODES OF AIMLESS WANDERING (PORIMANIA). Patients with CPSs may experience prolonged episodes of aimless wandering followed by retrograde amnesia for this behavior. This may represent a prolonged postictal autmatism and has been reported to respond to antiepileptic medication.

Differentail Diagnosis

In adults; CPSs must be differentaited from absence seizures, syncope, transient ischemic attacks, episodic dyscontrol syndrome , psychosis, Meniere's disease, and psychogenic seiures. In children, night terrors and sleepwalking must alsobe considered.

Epilepsy Types, Epilepsy Syndromes, and Cerebral Localization

CPSs usually occur as part of localization – related / symptomatic epilepsy. Within this epilepsy are four epilepsy syndromes named for the presumed location of onset: temporal lobe, frontal lobe parietal lobe and occipital lobe.

C.Partial Seizures Evolving to Secondarily Generalized (Tonic – Clonic, Grand Mal) Seizures

Definitions

Tonic – clonic seizures consist of an initial increase in tone of certain muscles (tonic phase) followed by bilateral sysmmetric jerking of the extremities (clonic phase).

Secondarily generalized tonic – clonic seizures begin with focal seizure activity and may be accompanied by clinical or EEG evidence of simple complex seizures, CPSs, or both.

Tonic – clonic seizures most often occura s part of localization related / symptomatic (patial, focal) epilepsy. However, tonic – clonic seizures may occuras part of many other adult epilepsy syndromes .

Regardless of epilepsy syndrome, tonic – clonic seizures share a number of common features, reviewed in this section, Special features of tonic – clonic seizures assciated with localization – related / symptomatic (partial, focal) epilepsy also are reviewed in this section.

Seizure Phenomena

A. AURA. Secondarily generalied tonic – clonic seizures may begin with signs or symptoms of focal seizure phenomena appropriate to the focus of origin (simple partial seizure phenomena, CPS phenomena, or both). However, most patients cannot recall an aura.

B. TONIC PHASE. The tonic phase usually consists of a brief phase in flexion, followed by a longer phase in extension. Consciousness is lost during the tonic phase. The flexion phase usually begins in the face (eyes oepn, ocular globes rotated upward, mouth held rigidly open), neck (held rigid in semiflexion), and trunk (chest bent forward on pelvis). The flexion phase then spreads to the extremities, involving the arms more than the legs and the proximal muscles more than thedistal muscles. The arms are elevated, adducted, and externally rotated, and the legs and thighs are flexed, adducted, and externally rotated.

The extension phase begins in the axial musculature with extension of the back and neck. The mouth snaps shut (the tongue may be bitten). The thoracic and abdominal muscles then contract, sometimes producing a "tonic cry" as air is forced over the vocal cords. The arms are lowered and adducted. The forearm may remain flexed or may be extended and

pronated. Fingers may be clenched on the extended wrists or extended on flexed wrists. The legs are extended, adducted, and externally rotated.

During the period of transition from the tonicto the clonic phase (vibratory tonic period), tetanus becomes less complete. Tonic rigidity is replaced by a fine tremor, which increases in amplitude and decreases in frequency from 8 to 4 Hz. The tremor is caused by intrmittent decreases in tone. It begins in the extremities and spreads proximally.

C.CLONIC PHASE. During the clonic phase, muscle relaxation completely interrupts tonic contraction. The rhythmic return of muscle tone causes the appearance of rhythmic jerks, which become farther and farther apart, until the seizure ends. The tongue may be bitten during clonic masseter movements. Each jerk may be accompanied by a cry.

D.AUTONMIC PHENOMENA. Autonomic phenomena begin in the preictal phase, are maximal at the end of the tonic phase, and decrease abruptly at the onset of the clonic phase. Autonomic phenomena that may be observed during a tonic – clonic seizure include increased blood pressure, increased heart rate, increased bladder pressur, increased sphincter tone, flushing, cyanosis, piloerection, perspiration, increased salivation, and increased bronchial secretion.

Apnea beging with violent expiration at the onset of the tonic phase and persists during the tonic and clonic phases (except forviolent, forced expirations with clonic jerks), and often into the early postictal period. Apnea cannot be explained entirely on the basis of muscular contractions; a central mechanism is probably involved in maintaining it.

E.IMMEDIATE POSTICAL PHASE. Complete muscular relaxation does not occur immediately in the postictal phase. About 5 seconds after the last clonic jerk, a new period of tonic contraction begins, lasting from several seconds to 4 minuts. Muscle tone is most increased in the cephalic muscles, and the tongue may be bitten. The trunk and arms may be extended but not as violently as during the tonic phase.

Between the last clonic jerk and the immediate postictal tonicphase, the bladder sphincter muscles relax; at this point, incontinence may occur.

Respirations return during the immediate postictal phase . The combination of a clenched jaw and increased secretions results in partial obstruction of respiration. Respirations are stertorous, And accessory muscles of respiration are activated. Blood pressure and skin resistance return to normal, but tachycardia persists. Cyanosis changes to pallor. Loss of consciousness remains complete, and pupillay and cutaneous reflexes are absent . Deep tendon reflexes are variabley modified.

F.LATER POSTICTAL PHASE- In the later postictal phase, flaccidity is more or less complete. The cardiac rate returns to normal. Deep tendon reflexes are usually diminished, and the plantar response is sometimes extensor. The patient may awaken by passing through successive stages of coma, confusional state, and drowsiness or may pass directly into sleep without awakening.

G. DURATION OF PHASES. The average duration of the various phases of a tonic – clonic seizure are as follows: tonic phase, 10 to 30 seconds; clonic phase , 30 to 50 seconds; immediate postictal phase, 1 to 5 minutes; later postictal phase, 2 to 10 minutes; total, 5 to 15 minutes. Individual phase duration and clinical expressin are highly variable in partial seizures secondarily generalized, suggesting multiple routes of spread.

H.TONIC – CLONIC STATUS EPILEPTICUS.

Complications

The possible complications of tonic – clonic seizures are summarized here in order of likelihood. Tonic – clonic status epilepticus incresases the risk of all these complications.

A. ORAL TRAUMA. The tongue, lip, or cheek may be macerated.

B. HEAD TRAUMA. Skull fractures, contusions , and epidural or subdural hematomas may result from head injury caused by falls or clonic activity.

C.STRESS FRACTURES. Compression fracturess of thoracic or lumbar vertebrae may occur; they are often asymptomatic and morecommon in the elderly.

D.ASPIRATION PNEUMONIA. Aspiration of secretions or regurgitated stomach contents may occur when the airway's normal protective reflexes are inhibited postictally; they may be lifethreatening.

E.POSTICTAL PUIMONARY EDEMA. Postictal pulmonary edema is a rare complication (immediate or delayed) manifested by dyspnea, cough, blood – stained sputum, and abnormal chest x-ray. This complication usually requires only oxygen therapy and needs to be differentiated from aspiration pneumonia.

EEG Phenomena

A. INTERICTAL PHASE. Focal spikes, sharp waves, or slowing may be present during the interictal phase

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B. INITIAL PHASE. During the initial ictal phase of a secondarily generalized tonic – clonic seizure, the EEG may show focal attenuation, sharp waves, or slow activity.

C.TONIC PHASE The tonic phase beins with a 1- to 3 – second period of EEG flattening (desynchronization) or with low – voltage fast activity. Then, surface negative waves at about 10 Hz appear and increase rapidly in amplitude (epileptic recruiting rhythm). After approximately 10 seconds, the recruiting rhythm is combined with an apparently separate rhythm of slow waves, increasing in amplitude and decreasing in frequency from 3 to 1 Hz. The slow rhythm becomes progressively more prominent, and the recruiting rhythm becomes progressively less prominent, until the recruiting rhythm appears only as brief bursts of rapid activity between surface – negative slow waves.

D.CLONIC PHASE. During the clonic phase, bursts of 10 – Hz recruiting rhythm alternate with slow waves. Bursts of recruiting rhythm are associated with generalized jerks, and slow waves are associated with relaxatin. Theslow waves become slower and the bursts of recruiting rhythm become farther apart.

E.POSTICTAL PHASE. The EEG is isoelectric for a few seconds to 1 minute afer the last clonic jerk (cortical exhaustion). Then, low – voltage ,

very slow activity appears. The EEG progressively picks up in voltage and frequency.

Differentail Diagnosis

Partial seizures evolving to secondarily generalized seizures occurring as part of localization – related / symptomatic epilepsies must be differentiated from primaily generalized tonic – clonic seizures occurring as part of generalized / idiopathci epilepsies. Secondarily generalied seizures are suggested by (a) evidence of structural brain damage (neurologic examination, imaging studies); (b) onset with symptoms or signs suggesting simple partial seizure, CPS, or both; and (c) focal sharp or slow activity on interictal EEG. Primarily generalized seizures are suggested by (a) absence of evidence of structural braindamage; (b) positive family history for seizures; (c) coexisting myoclonic or absence seizures; (d) occurrence shortly after awakening; (e) aura of bilateral myoclonic jerks; and (f) generalized spike – wave or polyspike wave on interictal EEG.

Tonic – clonic seizures must also be distinguished from syncope and psychogenic seizures in patients of all ages. In children, tonicclonic

seizures must be distinguished from breath – holding spells and prolonged QT syndome.

Epilepsy Types, Epilepsy Syndromes, and Cerebral Localization

Partial seizures secondarily generalized usually occur as part of localization – related / symptomatic epilepsy. Within this epilepsy are four epilepsy syndromes named for the presumed location of onset: tempormal lobe, frontal lobe, parietal lobe, or occipital lobe.

II.GENERALIZED SEIZURES (CONVULSIVE OR NONCONVULSIVE)

A.Absence (Petit Mal) Seizures

Definitions

Absence seizures are generalized seizures, indicating bihemispheric, initial involvement clinically and on EEG. They have a rapid onset and offset and most frequently are characterized by a change in facial expression, motionless blank staring, and automatisms. Absence seizures are divided in to typical and atypical. Many children with absence seizure can be further categorized as having a characteristic epileptic syndrome.

Classification of absence seizures
I . Typical absence seizures
A. Simple – impairment of consciousness only
B. Complex
1. With mild clonic components
2. With changes in tone
3. With automatisms
4. With autonomic components
II. Atypical absence seizures
III. Absence status epilepticus

Seizure Phenomena

A.TYPICAL ABSENCE SEIZURES. Although typical absence seizures may occur at any age, they rarely start before the age of 2 or after the teenage years. The hallmark of the typical absence seizure is the suppression of mental function, usually to the point of complete abolition of awareness, responsiveness, and memory. The seizures start abruptly, without an aura, and typically last from a few seconds to one – half minute, although, at times, they last more than 1 minute. Ongoing activity is suddenly interrupted; the child changes facial expression and becomes transfixed (like a statue). In a simple typical absence seizure, the child stares with a motionless, distant appearance. At the end of the seizure, or the seizure, the child usually returns to the gesture, sentence,or other activity that the seizure interrupted. Postictal fatigue never occurs, although the child may be momentarily confused by the "time loss". This "time loss"

may serve as a clue to the child that a seizure occurred, even though complete amnesia for events during the seizure may be experienced.

Maximum impairment of responsiveness usually occurs during the first few seconds of an absence seizure, regardless of whether the total duration of the seizure is brief or long. T times, the suspension of mental function is less complete, especially at the end of certain longer attacks. At this time, mild confusion without complete loss of awareness may occur. When this happens, the child may be able to continue simple and automatic behavior. At times, the impairment of consciousness is so slight that it passes unnoticed by observes and may be detected only during EEG monitoring.

Simple absence seizures are relatively rare. The majority of typical absence seizures are complex typical absence seizures, consisting of clonic or myoclonic activity, automatisms, and changes in postural tone. Automatiosms occur frequently in absence seizures. Automatic behavior may consist of licking the lips, chewing , grimacing , scratching, or fumbling with the clothes, The longer the seizure, the more likely that automatisms will occur. More complex activity, such as dealing cards or moving chess pieces, may occur if the activity is ongoing at the onset of the seizure, Although speech may continue to occur during an absence seizure, the speed usually slows.

B.ATYPLCAL ABSENCE SEIZURES. Atypical absences are those seizures in which the onset, the cessation, or both are not as abrupt as in typical absences, and in which changes in tone are more dronounced than in typical absences. Atvpical absence. Like trpical absences, may be associated with automatisms, clonic components, and autonomic components, as well as changes intone. However, automatisms are not as frequently seen in atypical absence as in typical absences. Atypical absence seizures frequently have a longer duration than typical absences, sometimes lasting several minutes.

C.ABSENCE STATUS EPILEPTICUS.

EEG Phenomena

A hallmark of absence seizures is the sudden onset of either generalized symmetric spike – wave or mulitpe spike – and – slow – wave complexes. In typical absence seizures, the spike – and – wave complexes usually occur at a frequency of 3 Hz (range , 2.5 to 3.5 Hz;). At times, the discharge may begin with frontal spikes, occurring either unilaterally or bilaterally Only when the spikes are persistently focal and precede the generalized discharge by several seconds should the diagnosis of a partial seizure with secondary, generalization be considered. Likewise, after a

generalized discharge 1 or 2 seconds of rhythmic frontal delta activity without spikes may occur.

Hyperventilation is a potent activator of typical absence seizures. Failure to induce an absence seizure with several trials of hyperventilation of 3 to 5 minutes' duration in an untreated patient makes the diagnosis of absence seizures unlikely. Photic stimulation may also induce absence seizures, although the frequency for activation is not as high as with hyperventilation.

Focal spikes, particularly in the frontal region, or bilateral frontal spike – and – wave discharges are commonly seen in children with absence seizures. It has been suggested that these represent remnants of generalized discharges that did not fully propagate to the surface of the brain.

Unlike the usual 3 – Hz spike – and – wave discharges that occur in typical absence seizures, slow spike – and wave discharges occurring at 1.5 to 2.5 Hz are more characteristic of atypical absence seizures The interictal EEG is usually abnormal in patients with atypical absences.

Differential Diagnosis

Absence seizures must be differentiated from CPSs and day dreaming.

Daydreaming is associated with boredom, can be "broken" with stimulation, and is not associated withmotor activity. Absence seizures, however, can sometimes be terminated with stimulation and tend to increase during periods of relaxation and tiredness. A normal EEG that includes several trials of 3 to 5 minutes of hyperventilation, however, virtually rules out absence seizures.

Epilepsy Types and Epilepsy Syndrome

Typical absence seizures usually occur as part of generalized/ idiopathic epilepsies and may be part of three epilepsy syndromes: childhood absence epilepsy syndrome, juvenile absence epilepsy syndrome, and juvenile myoclonic epilepsy syndrome.

Atypical absence seizures occur as part of general ized/symptomatic epilepsies and the Lennox – Gastaut syndrome.

Etiology

The lack of structural pathology and the age – specific window observed in most patients with typical absence seizures implicate a hereditary etiology. Patients with atypical absence seizures have a higher

likelihood of acquired disease. often, patients with atypical absecne seizures will have the Lennox – Gastaut syndrome.

B. MyoclonicSeizures

Definition

Myoclonic seizures are characterized by sudden, brief (less than 350 msec) , shocklike contractions that may be generalized or confined to the face and trunk, or to one or more extremities, or even to individual muscles or groups of muslces. Myoclonic seizures result in short bursts of synchronized electromyographic (EMG) activity, which often involves simultaneous activation of agonist and antagonist muscles. The contractions of muscles are quicker than the contractions of clonic seizures.

Seizure Phenomena

Any group of muscles can be involved in a myoclonicseizure. Myoclonic seizures may be dramatic, causing the patient to fall to the ground , or quite subtle, resembling tremors. Because of the brevity of the seizures, determining whether consciousnes is impaired is impossible.

Altough myoclonic seizures can sometimes be the only seizure type present, they often occur in combination with other seizure types.

EEG Phenomena

Myoclonic seizures are typically associated with generalized spike – and – wave or multiple spike – and – wave discharges on the EEG.

In early myoclonic epileptic encephalopathy, the EEG demon strates a burst – suppression pattern.

Myoclonic jerks may be correlated with bursts of generalized epileptiform discharges, but no link between the EEG discharges and myoclonic jerks recorded using EMG techniques, the so – called EEG – EMG dissociation, may be obvious. However, back – averaging of EEG at the time of the EMG discharge may demonstrate a time link between the two events. Myoclonic seizures are frequently associated with exaggerated photosensitivity.

Differential Diagnosis

Myoclonic jerks are so brief that they may be missed by parents and physicians. Once seen, diagnosis is usually not difficult. Like simple partial seizures, myoclonic, myoclonic seizures may occasionally be confused with tics.

Etiology

Myoclonic seizures can be seen in both acquired and familial disorders. Virtually any etiologic agent that leads to brain damage can be associated with myoclonic seizure . Therefore, myoclinic seizures are a part of many epilepsy types and many epilepsy syndromes.

Epilepsy Types and Epilepsy Syndromes

Myoclonic seizures occur at all ages, from neonatesto the elderly. Myoclonic seizures may be part of the following epilepsy types: generalized / idiopathic, generalized / symptomatic, generalized / either idiopathic or symptomtic , both localization – related and generalized , situaion – related , and special syndromes.

C.Tonicand Atonic Seizures

Defintions

Tonic seizures are brief seizures consisting of the sudden onset of increased tone in the extensor muslces. If standing, the patient typically falls to the ground. The duration of these seizure is longer than myoclonic seizures. EMG activity is dramatically increased in tonic seizures. Conversely, atonic seizures consis of the sudden loss of muscle tone . The

loss of muscle tone may be confined to a group of muscles, such as the neck , resulting in a head drop, or it may involve all trunk muscles, leading to a fall to the ground.

Seizure Phenomena

Tonic seizures frequently begin with a tonic contraction of the neck muscles, leading to fixation of the head in an erect position, widely opened eyes, and jaw – clenching or mouth – opening. Contraction of the respiratory and abdominal muscles often follows and may lead to a high – pitch ed cry and brief periods of apnea. The tonic contractions may extend to the proximal musculature of the upper limbs, elevating the shoulders and abducting the arms.

Asymmetric tonic seizures vary, from a slight rotation of the head to a tonic contraction of all the musculature of one side of the body. Occasionally, tonic seizures terminate with a clonic phase. Eyelid retraction staring, mydriasis, and apnea are commonly associated with the motor activity and may be the most prominent features. The seizures may cause falls and injury.

Tonic seizures are typically activated by sleep and may occur repetitively throughout the night. They are much more frequent during non

– rapid eye movement sleep than during wakefulness and usually do not occurr during rapid eye movement sleep. During tonic seizures, the patient is unconscious , although arousal from light sleep may occur. Because these seizures are often very brief, they frequently go undetected. Tonic seizures are usually brief, lasting from a few seconds to 1 minute, with an average duration of about 10 seconds. In seizures lasting longer than a few seconds, impairment of consciousness is usually apparent Postictal impairment with confusion, tiredness, and headache is common. The degree of postictal impairment is usually related to the duration of the seizure.

Atonic seizures begin suddenly and without warning and cause the patient, if standing , to fall quicklyto the floor. Because total lack of tone may occur, the patient has no means of self protection, and injuries often occur. The attack may be fragmentary and lead to dropping of the head with slackening of the jaw, or dropping of a limb. In atonic seizures, a loss of EMG activity should occur. Consciousness is impaired during the fall, although the patient may regain alertness immediately on hitting the floor. Tonic and atonic seizures can occur in patients of all ages. However.

Ever, they most often begin during childhood, as part of one of several epilepsy syndromes.

EEG Phenomena

The interictal EEG of patients with tonic seizures is usually quite abnormal, consisting of slowing of the background, with multifocal spikes, sharp waves, and burst of irregular spike – and wave activity. The EEG – ictal manifestations of tonic seizures usually consist of bilateral synchronous spikes of 10 to 25 Hz of medium to high voltage, with a frontal accentuation. Simple flattening or desynchronization may also occur. Occasionally, multiple spike and wave or diffuse, slow activity may occur during a tonic seizure.

Atonic seizures are usually associated with rhythmic spike and wave complexes varying from slow (1 to 2 Hz) to more rapid, irregular spike – and wave or multiple spike –and wave activity.

Differential Diagnosis

Tonic seizures are usually not difficult to diagnose. Sometimes children with very severe encephalopathies have episodes of opisthotonic posturing that may resemble tonic seizures. Recording an episode usually helps distinguish the two events; tonic seizures are associated with spike – wave

discharges or a discharge of rapid spikes, whereas no epileptiform discharges shouldbe seen during opisthotic posturing.

Paroxysmal choreoathetosis is a rare, usually familial, disorder characterized by episodic attacks of severe dystonia, choreathe tosis, or both. Two types have been described: paroxysmal dystonic choreathetosis of Mount and Reback and paroxysmal kinesigenic choreathetosis. In paroxysmal dystonic choreoathe tosis, the patient has a sudden onset of severe , often painful, dystonia that may affect the arms, legs, or trunk and speech

Consciousness is not impaired during the attacks, which last from minutes to hours and are often precipitated by alcohol, caffeine, excitement, stress, or fatingue. The disorder is inherited through an autosomal dominant pattern. Paroxysmal kinesigenic choreoathetosis is characterized bythe sudden assumption of dystonic posturing or choreoathetosis. The kinesingenicattacks are usually shorter in duration than the dystonicfrom and are frequently induced by sudden movements or a startle. These attackes can occur hundreds of times daily.

Spasmus nutans is a disorder occurring in toddlers that is char acterized by head tilt, head nodding, and nystagmus, which is often asymmetric. The head nodding may be confused with atonic seizures. Spasmus nutans is

usually a self – limiting condition, disappearing after a period of 4 months to several years.

Etiology

Virtually any disorder that can lead to brain damage may result in tonicand atonicseizures. Common etiologies include hypoxic ischemic encephalopathy, head injuries, encephalitis, strokes, congenital brain anomalies, and metabolicdisturbances.

Epilepsy Types and Epilepsy Syndromes

Tonic and atonic seizures most often occur as part of generalized / symptomatic epilepsies and one of the following epilepsy syndromes: atonic seizrures, tonic seizures, and Lennox –Gastaut syndrome Tonicseizures also may occur as part of neonatal seizures or febrile convulsions. Atonic seizures also may occur as part of myoclonic akinetic epilepsy syndrome.

D.Clonic Seizures

Clonic seizures occur almost exclusively in neonates and young children. The attack begins with loss or impairment of consious ness,

associated with sudden hypotonia or a brief, generalized tonic spasm. This is followed by 1 to several minutes of bilateral jerks, which are often asymmetric and may predominate in one limb. Duringthe attack , great variability may be seen in the amplitude, frequency, and spatial distribution of these jerks from moment to moment. In other children, particularly those aged 1 to 3 years, the jerks remain bilateral and synchronous throughout the attack Postictally, recovery may be rapid, or a prolonged period of confusion or coma may occur.

E.Tonic – Clonic (Grand Mal) Seizures

1 . Definitions , Seizure Phenomena , EEG Phenomen , and differenetial Diagnosis

The tonic – clonicseizures associated with generalized seizures are similar in most clinical and EEG respects to tonic – clonic seizures associated with partial seizures.

2 . Epilepsy Types and Epilepsy Syndromes

Generalized – onset tonic – clonic seizures may occur as part of the following epilepsy types : generalized / idiopathic, generalized / symptomatic, generalized / either idiopathic or symptomatic, both local

ization – related and generalized , and special situations. The many epilepsy syndomes may occur as part of these epilepsies.

Material and method

In this study my attempt based on assessment of Adult age epilepsy which accopanying with MRI abnormality that couse to fit or triggering factor in this issue. There fore any patient that comes to neurology clinic with positive history for seizure even only one time with EEG abnormality that compatible to clinical manifestation had been known to epileptic case ; of course his / her age must be greater than 18 years old. For achieving to this goal, I provide a questionaire form for any patient that had been filled in two situationfirst : Patient had been done MRI in recent date there fore questionaire had been completed. Insecond form patient don't have any MRI unitl present therefoe he/she must be take MRI for completion of question narre form. About another problem in this survey I can point to exclusive diagnosis of seizure type and probably epileptic syndrom that patient marifestation and EEG findiy had been fulfilled. This problem completely resolved by expert and skillful neurologist that help me in this implication by Consideration to physical examinatin , age of paticnt , sex and history either head trauma or drug listory or family history or

psychiatric or onset of seizure or any MRI fining and EEG problem or likely perinatal or congenital Anomaly.

Questionaire is asked own patient or nearest relative for high level of reliability. Any famili history that had been asked about maternal or paternal orsibling. About head trauma even minor accident without unconsiousness ness had been considered to in other boundary of spectrum include depressed fracture with unconsciouns ness with or without any meurosurgical intervention.

History of any comobidity which neurologicor others had been questioned. In ther other hand about drug history my attept hased on at first to discover. Presence of any drug therapy for feizure and in second step identigyig any drug that had been used . About seizure onset which is most important part of seizure history taking that help in differential diagnosis of any type of epileptic syndorms . About MRI fidng in first stage mustbe any abnor mality hadbeen approved by reading of MRI result page in later stge If abnormality is declared any characteristic feature of abonraliteirs must be registered in questionaire form.

Reference (Journal):

Journal of neurology neurosurery psychiatry 2003 April

Journal of Indian Med association 1994 April

Journal of Europian Radiology 2002 march

Journal of Epilepsy research 1988 January february

Reference (article)

German article Nervenarzt 2001 December

Spanish article Gac med nex 1999 Juli – August

German article Rofo Fortschr Geb Rontgestr neuen Bildgbe verfahr 1999 march

French article sante 1999 January – february

Reference (book)

Merrit Neurology 2000

Harrison principle of Internal medicine 15 th editin 2001

Epilepsy: A text look laidlow / Richens / oxley 3 rd editon 1988

Epilepsy: Diagnosis and mangement Ernt Neidenmeyer 1990

Craniospinal Magnetic Resonance Imaging Pomeranz 1989

Goodman gilman : The pharmacological Basis of therapeuties 9 th editon 1996

Robbins: Pathological Basis of disease ROBBINS / Cotran / kumar / Collins 6 th edition 1999

Epilepsy : Thomas R.Browne / Gregory L.Holmes 2 nd edition 2000

Textbook of Radiology and medical Imaging David sutton 4 th edition

Questionaire sample

1 – Date

2 – name

3 – sex *male* *female*

4 – Age (greater than 18 y old)

5 – family history *yes* *no*

6 – History of head tranuma *yes* *no*

7- Comorbidity *yes* *no*

8 – Drug history *yes* *no* *include:*

9 – Seizure onset since:

10 – Seizure type:

* *partial seizure: A) simple partial seizure:*

B) Complex partial seizure:

C) Partial seizure with secondary generalizetion

• *Primary generalized seizure: A) Absence (petit mal) seizure*

B) myoclonic seizure

C) Tonic seizure

D) Atonic Seiure

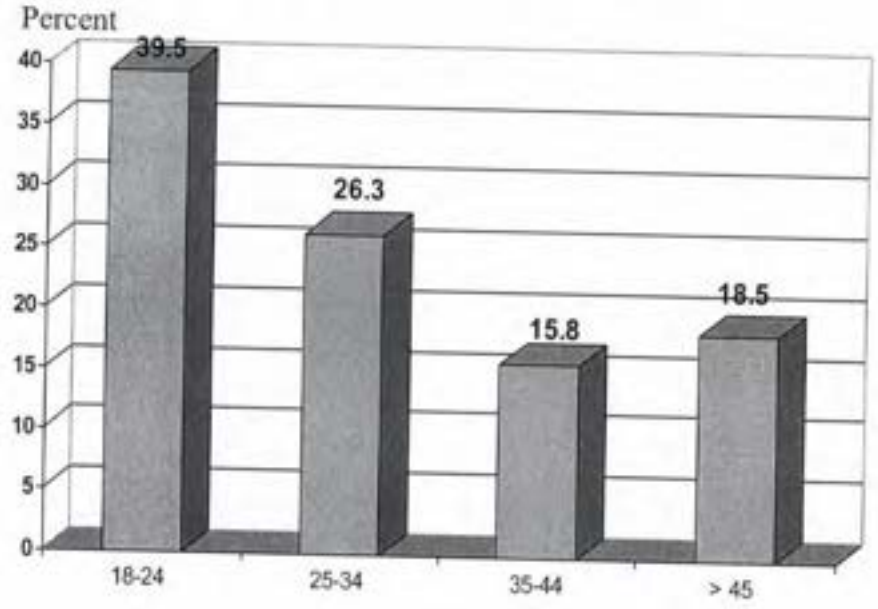
E) Clonic seizure

F) tonic – clonic (grandmal) seizure

* *unclassified seizure:*

11 – MRI finding: Normal *Abnormal:* *include:*

Total epileptics age prevalence



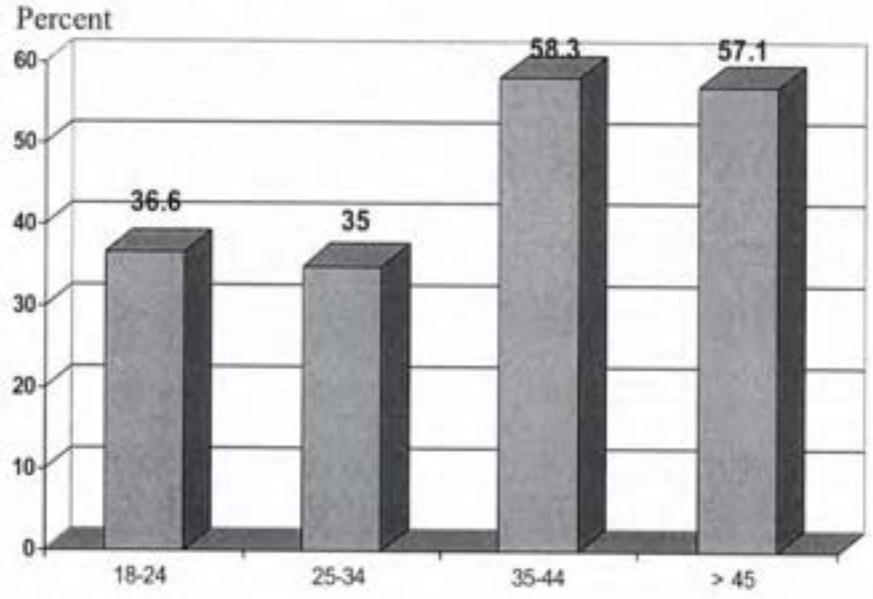
Prevalence Rate

Age	Percent
18-24	39.5
25-34	26.3
35-44	15.8
>=45	18.5
Total	100

Namber of patients	
Age	Cases
18-24	30
25-34	20
35-44	12
>=45	14
Total	76

Comment::

Male patients prevalence



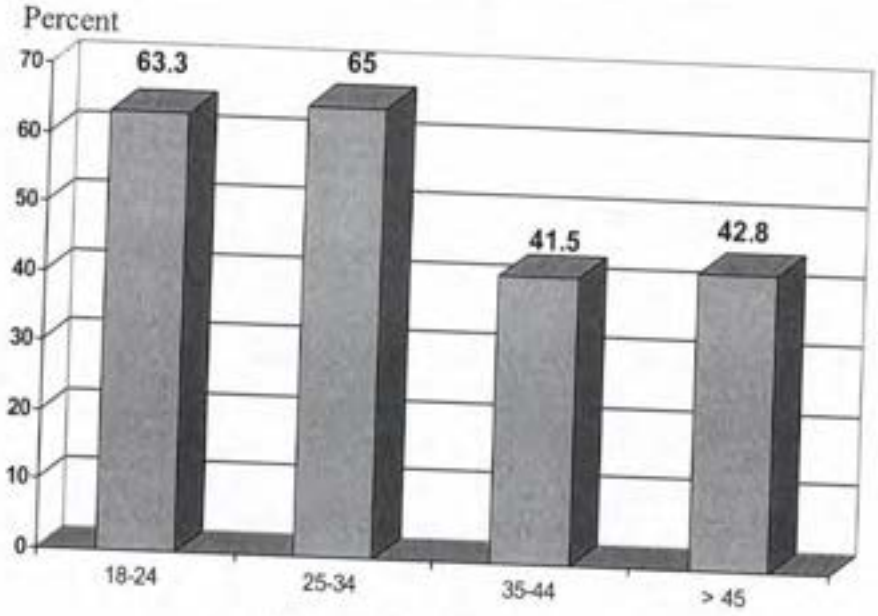
Prevalence Rate

Age	Percent
18-24	36.6
25-34	35
35-44	58.3
>=45	57.1
Total	43.4

Namber of patients		
Age	Cases	Observed
18-24	30	11
25-34	20	7
35-44	12	7
>=45	14	8
Total	76	33

Comment::

Female patients prevalence



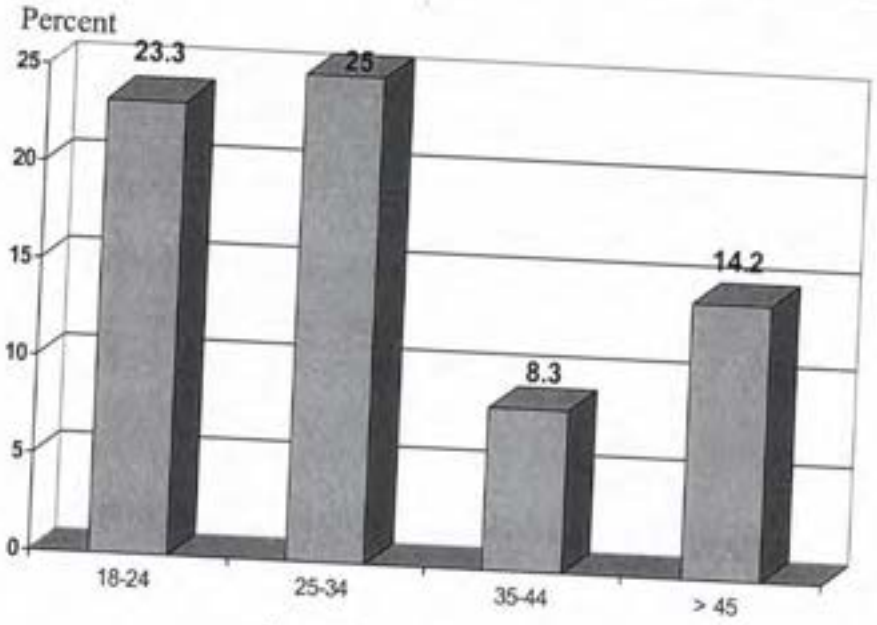
Prevalence Rate

Age	Percent
18-24	63.3
25-34	65
35-44	41.5
>=45	42.8
Total	56.5

Namber of patients		
Age	Cases	Observed
18-24	30	19
25-34	20	13
35-44	12	5
>=45	14	6
Total	76	43

Comment::

Positive family history prevalence



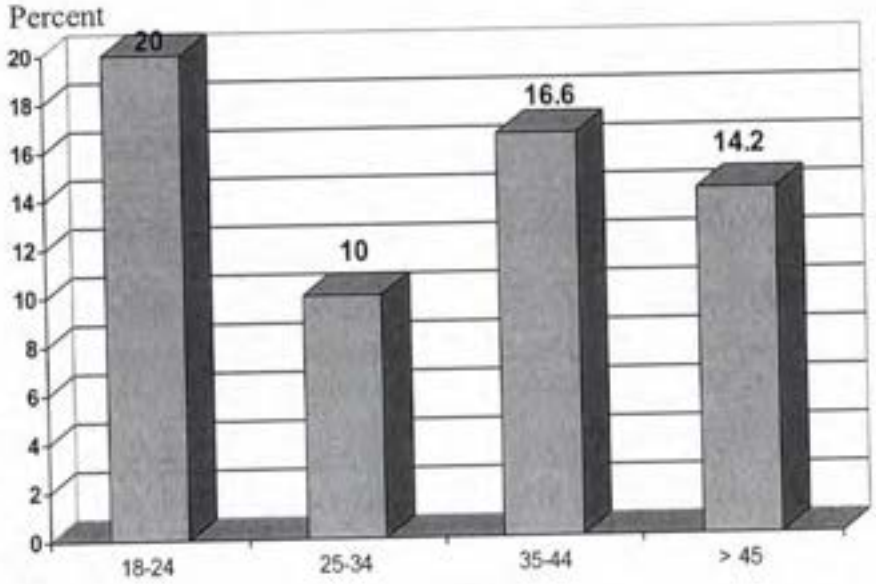
Prevalence Rate

Age	Percent
18-24	23.3
25-34	25
35-44	8.3
>=45	14.2
Total	19.7

Namber of patients		
Age	Cases	Observed
18-24	30	7
25-34	20	5
35-44	12	1
>=45	14	2
Total	76	15

Comment::

Positive Head trauma history prevalence



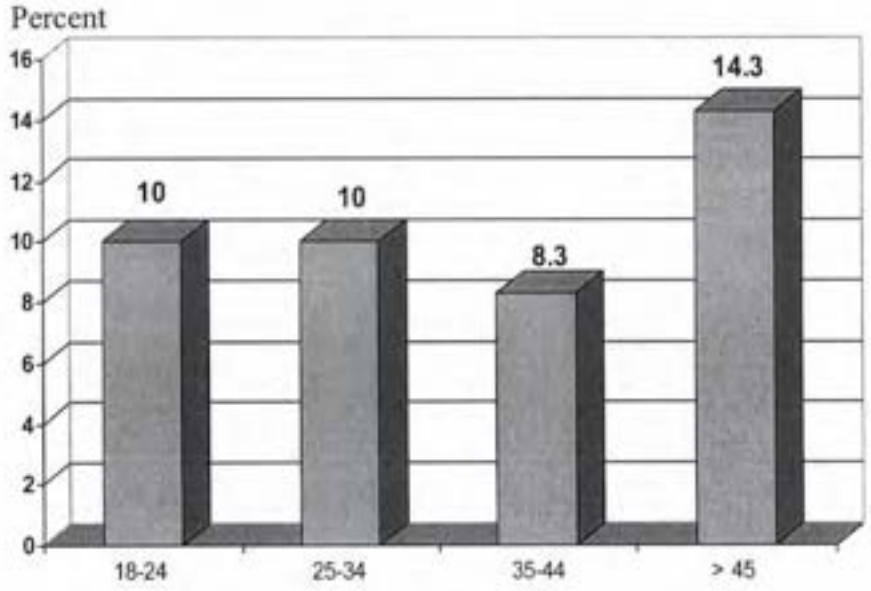
Prevalence Rate

Age	Percent
18-24	20
25-34	10
35-44	16.6
>=45	14.2
Total	15.8

Namber of patients		
Age	Cases	Observed
18-24	30	6
25-34	20	2
35-44	12	2
>=45	14	2
Total	76	12

Comment::

Seizure with comorbidity



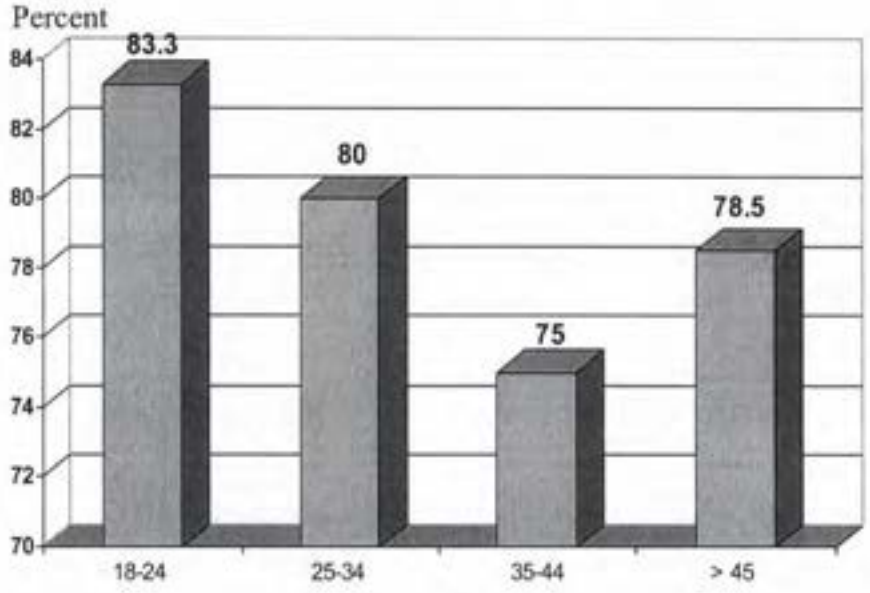
Prevalence Rate

Age	Percent
18-24	10
25-34	10
35-44	8.3
>=45	14.3
Total	10.5

Namber of patients		
Age	Cases	Observed
18-24	30	3
25-34	20	2
35-44	12	1
>=45	14	2
Total	76	8

Comment::

Positive drug history prevalenve



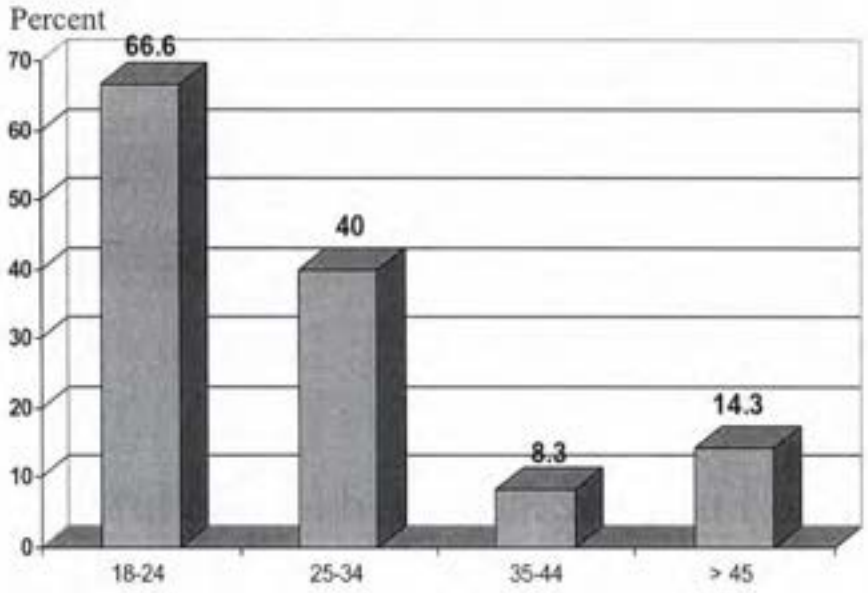
Prevalence Rate

Age	Percent
18-24	83.3
25-34	80
35-44	75
>=45	78.5
Total	80.3

Namber of patients		
Age	Cases	Observed
18-24	30	25
25-34	20	16
35-44	12	9
>=45	14	11
Total	76	61

Comment::

Seizure onset before 18 years old



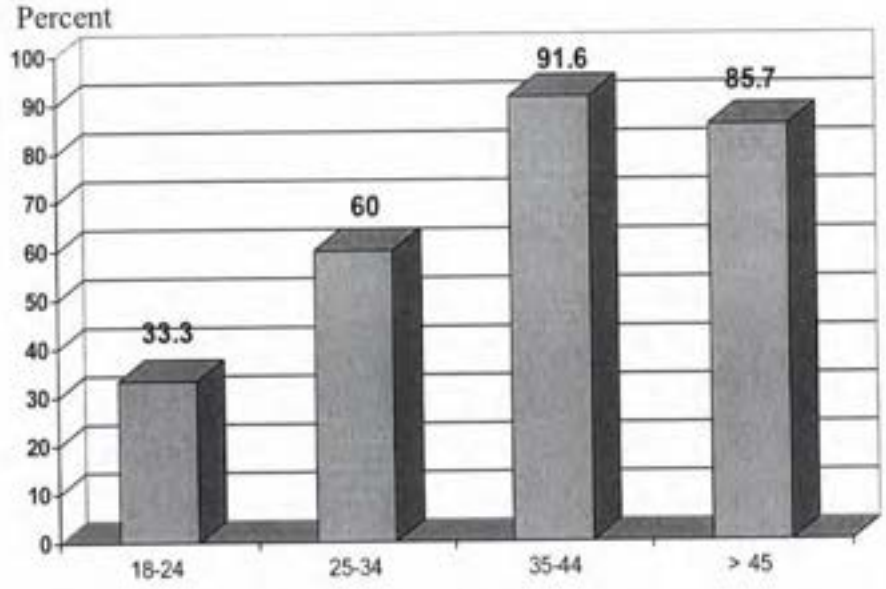
Prevalence Rate

Age	Percent
18-24	66.6
25-34	40
35-44	8.3
>=45	14.3
Total	40.8

Namber of patients		
Age	Cases	Observed
18-24	30	20
25-34	20	8
35-44	12	1
>=45	14	2
Total	76	31

Comment::

Seizure onset after 18 years old



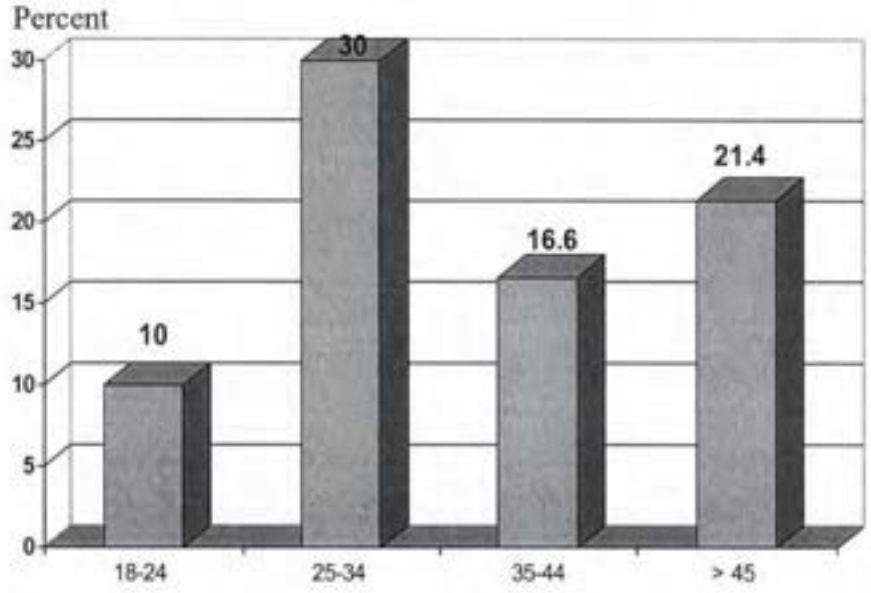
Prevalence Rate

Age	Percent
18-24	33.3
25-34	60
35-44	91.6
>=45	85.7
Total	59.2

Namber of patients		
Age	Cases	Observed
18-24	30	10
25-34	20	12
35-44	12	11
>=45	14	12
Total	76	45

Comment::

Total MRI abnormality prevalence



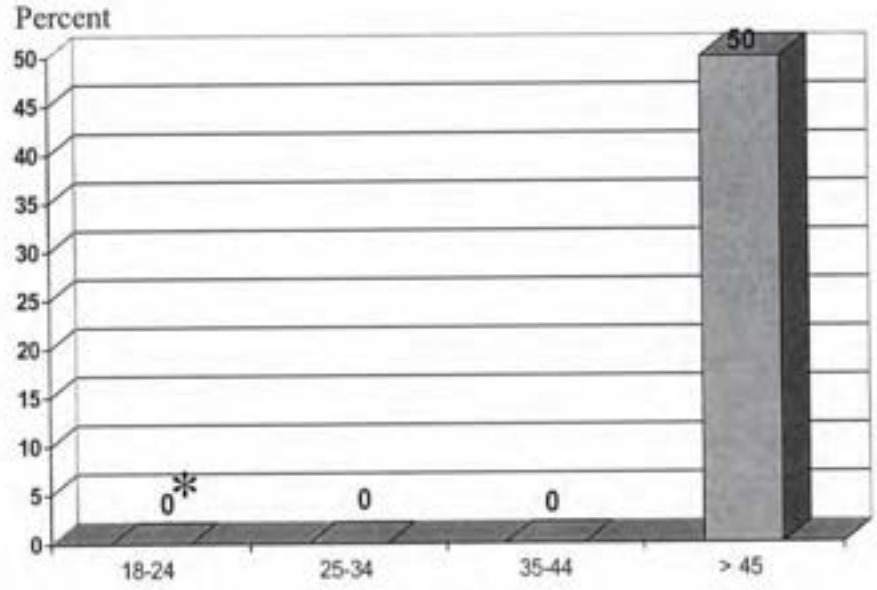
Prevalence Rate

Age	Percent
18-24	10
25-34	30
35-44	16.6
>=45	21.4
Total	18.4

Namber of patients		
Age	Cases	Observed
18-24	30	3
25-34	20	6
35-44	12	2
>=45	14	3
Total	76	14

Comment::

Prevalence of SPS with abnormality



Prevalence Rate

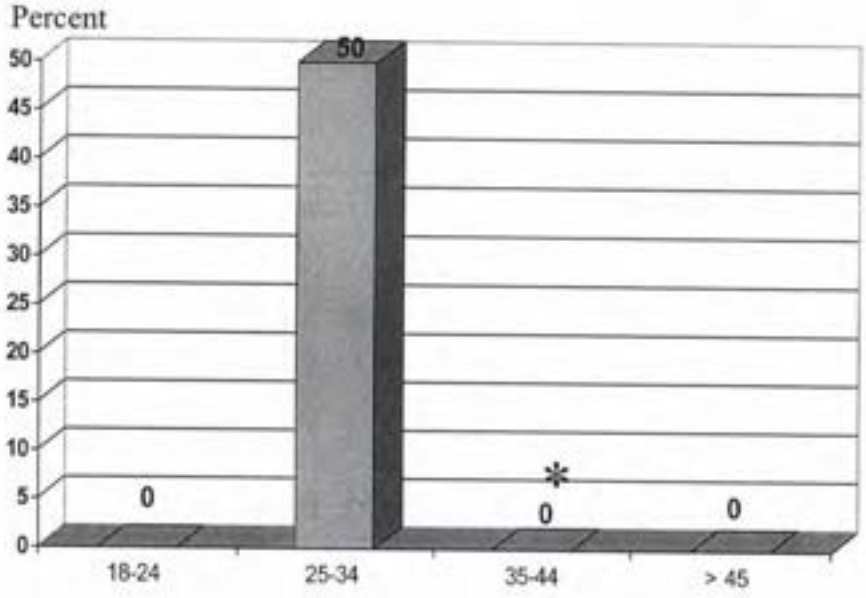
Age	Percent
18-24	0
25-34	0
35-44	0
>=45	50
Total	25

Namber of patients		
Age	Cases	Observed
18-24	0	0
25-34	1	0
35-44	1	0
>=45	2	1
Total	4	1

Comment:: SPS: Simple partial seizure

*: There is no patient in this age group.

Prevalence of CPS with abnormality



Prevalence Rate

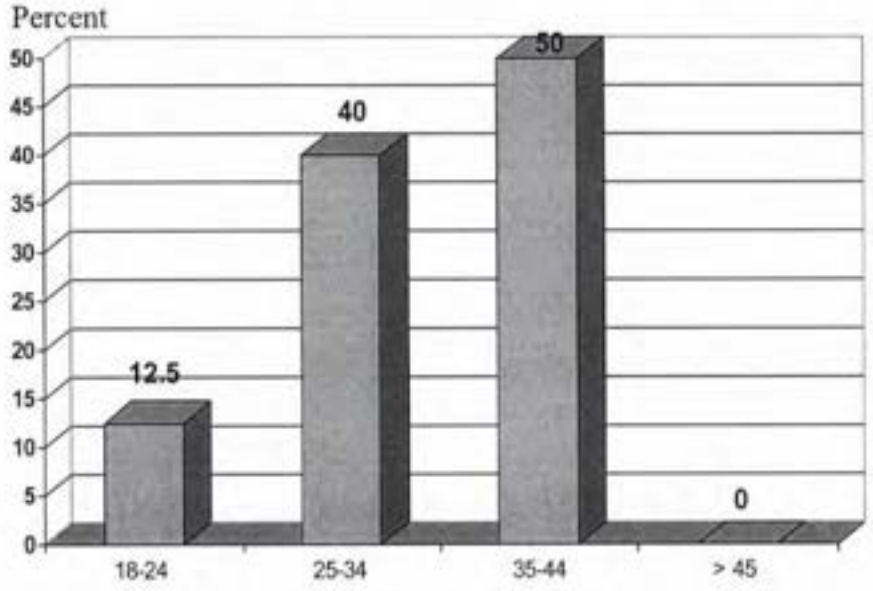
Age	Percent
18-24	0
25-34	50
35-44	0
>=45	0
Total	16.6

Namber of patients		
Age	Cases	Observed
18-24	2	0
25-34	2	1
35-44	0	0
>=45	2	0
Total	6	1

Comment:: CPS: complex partial seizure

*: There is no patient in this age group.

Prevalence of SGS with abnormality



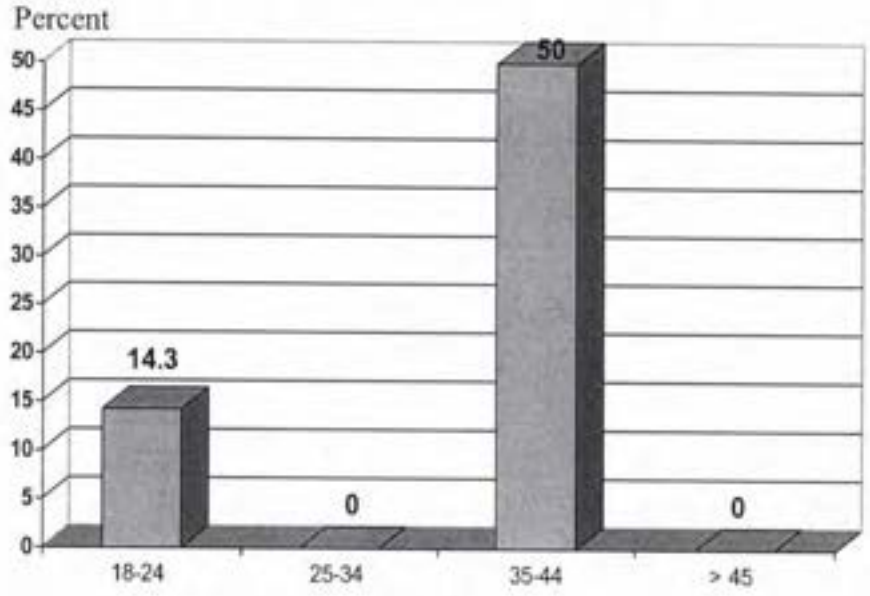
Prevalence Rate

Age	Percent
18-24	12.5
25-34	40
35-44	50
>=45	0
Total	21

Namber of patients		
Age	Cases	Observed
18-24	8	1
25-34	5	2
35-44	2	1
>=45	4	0
Total	19	4

Comment:: SGS:secondary generalized seizure

Prevalence of myoclonic seizure with abnormality



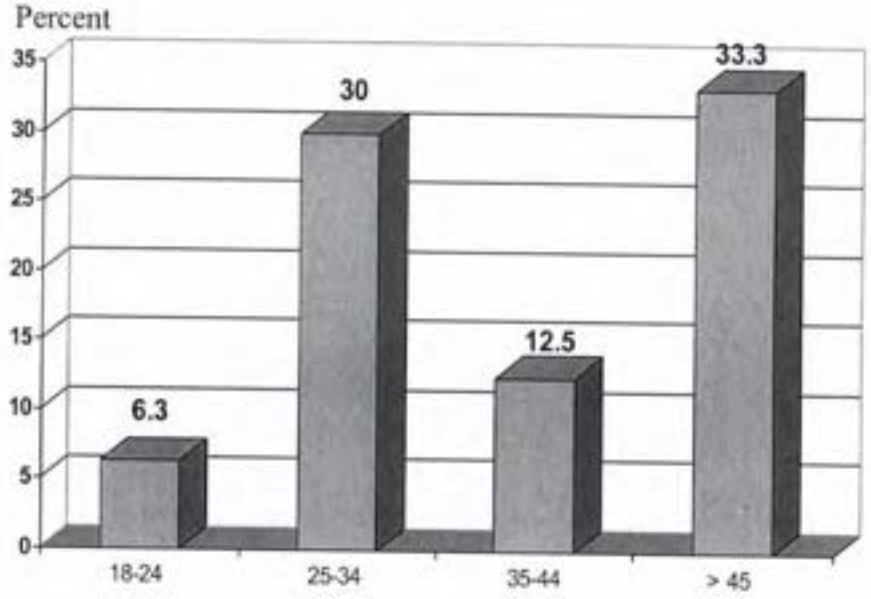
Prevalence Rate

Age	Percent
18-24	14.3
25-34	0
35-44	50
>=45	0
Total	14.3

Namber of patients		
Age	Cases	Observed
18-24	7	1
25-34	3	0
35-44	2	1
>=45	2	0
Total	14	2

Comment::

Prevalence of tonic clonic seizure with abnormality



Prevalence Rate

Age	Percent
18-24	6.3
25-34	30
35-44	12.5
>=45	33.3
Total	17.5

Namber of patients		
Age	Cases	Observed
18-24	16	1
25-34	10	3
35-44	8	1
>=45	6	2
Total	40	7

Comment::

Conclusion:

In according to this study, most Common type of epilepsy is related to Generalized tonic clonic seizure that include most Case of MRI Abnormalities.

Maximum Age prevalence is in 18-24 y that is 39.5% and male patient is dominent with percent of 63.3% . and in the other hand, greatest history of head trauma is related to this age group.

Almost 66.6% Cases of Early onset epilepsy is in 18-24 y Although prevalence of MRI Abnormality in this age group is minimum that meaning just %15/.

Finded Abnormalities include:

1 – Left parietal lobe meningioma

2 – Right parasagital meningioma

3 – micro infarct and small vessel disorder

4 – leukoencephalopathy

5 – Hyper signal defect and small vessel disorder

6 – Right frontal lobe AVM

7 – Tuber cinerum lipoma

8 – multiple white plaque

9 – septum pelucidum agenesis

10 – Brain atrophy

11 – left parietal AVM

12 – Proencephali cyst in Right temporal lobe

13 – single plaque in left periventricular white matter

14 – Right frontal encephalomalacy

خلاصه تحقیق

آبان ۱۳۸۳ دوره ۲۷ ورودی بهمن ۷۶

نام استاد راهنما: سرکار خانم دکتر خمسه نام دانشجو: عباس جداری فروغی

موضوع:

بررسی شیوع MRI abnormality مراجعین مبتلا به صرع بالای ۱۸ سال به کلینیک نورولـوژی بیمارستان امیرالمومنین در فاصله ۸۲/۱۱/۱ تا ۸۳/۶/۳۱

Definition:

Epilepsy: به معنی بروز دیسشارژهای متعدد الکتریک غیرطبیعی و حمله‌ای از نورونهای CNS می‌باشد که براساس انتشار دیسشارژها علائم نورولوژیک متعددی ممکن است ایجـاد کنـد کـه شامل از دست دادن هوشیاری، حرکات تشنجی اندامها، مات شدن، اتوماتیسـم، رفتـار حرکتـی غیرعادی، ادراکات حسی غیرطبیعی، اختلالات اتونوم و غیره.

انواع اپی لپسی شامل دو نوع کلی ***Generalized*** *و* ***Partial*** *می‌باشد.*

Generalized seizure *شامل* ***Petit mal(Abscense) – grand mal (tonic clonic)***

Atonic - Clonic - tonic - myoclonic *- و غیره می‌باشد.*

Partial Seizure *شامل :* ***Complex Partial seizure - Simple Partial seizure***

Secondary generalized seizure *و غیره ... می‌باشد.*

MRI Abnormality:

تمامی موارد Intracranial hemorhage، Infarction، Aneurism، mass lesion،

traumatic lesion ،white matter disorder ،AVM (Artrio venus Malformation).

و غیره را شامل می‌شود.

اهداف اصلی:

- تعیین شیوع کلی MRI Abnormality در صرع
- تعیین شیوع سنی MRI Abnormality در مبتلایان SPS (Simple partial seizure)
- تعیین شیوع سنی MRI Abnormality در مبتلایان CPS (Complex partial seizure)
- تعیین شیوع سنی MRI Abnormality در مبتلایان SGS (Secondary Generalized seizure)
- تعیین شیوع سنی Myoclonic seizure MRI Abnormality
- تعیین شیوع سنی MRI Abnormality در مبتلایان tonic clonic seizure

اهداف فرعی:

- تعیین شیوع سنی بیماران مصروع
- تعیین شیوع جنسی (Male / Female)
- بررسی شیوع موارد با سابقه فامیلی مثبت
- بررسی شیوع موارد با سابقه Head trauma
- بررسی شیوع موارد با Comorbidity
- بررسی شیوع موارد با Drug history مثبت
- بررسی شیوع Early onset epilepsy در بیماران مورد مطالعه
- بررسی شیوع late onset epilepsyدر بیماران مورد مطالعه

Material & method:

این مطالعه توسط پرسشنامه هایی که حاوی ۱۰ پرسش بوده است که ۸ مورد آن توسط گفته‌های خود بیمار تکمیل شده است که شامل نام، جنس، سن، سابقه فامیل، سابقه ضربه به سر، سابقه بیماری همراه، سابقه دارویی، مدت زمان تشنج، می‌باشد؛ ۲ مورد باقیمانده که نوع تشنج و یافته‌های MRI بیمار می‌باشد براساس شرح حال بالینی بیمار ، معاینه فیزیکی و EEG و پاسخ به درمان دارویی توسط نورولوژیت تشخیص داده شده است این مطالعه بر روی 76 بیمار مصروع بالای ۱۸ سال صورت گرفته که روش مطالعه بصورت descriptive و prospective و cross sectional می‌باشد.

Result:

از ۷٦ بیمار مورد مطالعه، ١٤ مورد MRI Abnormaity کشف شد که ۳ مورد آن در طیف سنی 24-18 سال، ٦ مورد آن در طیف سنی 34-25 سال، ۲ مورد آن در طیف سنی 44-35 سال، ۳ موردآن در طیف سنی بالای 45 سال قرار می‌گیرد از لحاظ نوع تشنج، یک مورد مربوط به sps، یک مورد مربوط به CPS و ٤ مورد مربوط به SGS ،۲ مورد مربوط به میوکلونیک و ۷ مورد مربوط به تونیک کلونیک جنرالیزه می‌باشد.

از لحاظ تعداد انواع مختلف تشنج از کل ۷٦ بیمار تحت بررسی ٤٠ مورد (52.6%) دچار تشنج tonic clonic ،١٤ مورد (18.4%) میوکلونیک، ۱۹ مورد (25%) SGS، و ٦ مورد (7%) CPS و ٤ مورد (5%) SPS می‌باشد.

از لحاظ سنی بیشترین بیماران در طیف سنی ٢٤-١٨ سال قرار داشتند که 63.3% آنان را زنان تشکیل می‌دهند اما در طیف سنی ٤٤-٣٥ سال و بالای 45 سال با وجود کاهش درصد اپی‌لپسی در حد 18.5%. درصد مراجعه آقایان تا ۵۷٪ افزایش یافته است از لحاظ سابقه مثبت فامیلی

بیماران ۳٤-۱۸ سال بیشترین موارد را تشکیل می‌دهند. بطور کلی 15.8% بیماران سابقه Head trauma مثبت دارند. در مطالعه فوق با افزایش سن، شیوع Comorbidity افزایش می‌یابد بطوری که در سن بالای ٤٥ سال 14.3% بیماران، مشکل زمینه‌ای دیگری نیز از قبیل CVA, IHD, DM, HPL, HTN و غیره را دارند از لحاظ سابقه مصرف داروی تشنج حدوداً 80.3% کل بیماران Anticonvulsant مصرف می‌کنند.

از لحاظ بررسی Seizure onset بیشترین موارد Early onset در گروه سنی 24-18 سال 66.6% بوده و بیشترین موارد Late onset در گروه سنی 44-35 سال 91.6 درصد بوده است.

Abnormality ها شامل:

1 – Left parietal lobe meningioma

2 – Right parasagital meningioma

3 – micro infarct and small vessel disorder

4 – leukoencephalopathy

5 – Hyper signal defect and small vessel disorder

6 – Right frontal lobe AVM

7 –Tuber cinerum lipoma

8 – multiple white plaque

9 – septum pelucidum agenesis

10 – Brain atrophy

11 – left parietal AVM

12 – Porencephalic cyst in Right temporal lobe

13 – single plaque in left periventricular white matter

14 – Right frontal encephalomalacy

Conclusion:

با توجه به نتایج بررسی فوق بیشترین موارد تشنج مربـوط بـه Generalized tonic clonic seizure می‌باشدکه بیشترین موارد Abnormality را شامل می‌شود.

طبق این مطالعه حداکثر شیوع سنی در جمعیت فوق الذکر در طیف سنی 24-18 سال می‌باشـد که حدود 39.5% می‌باشد که اکثریت نسبی با مردان 63.3 درصد را شامل می‌شود و از طـرف دیگر بیشترین سابقه مربوط به Head trauma در این طیف سنی قرار می‌گیرد.

در ضمن در حدود 66.6% موارد Early osset epilepry در گروه سـنی 24-18 سـال قـرار می‌گیرد از لحاظ شیوع MRI Abnormality در این گروه سنی کمترین موارد یعنی فقط 15% مشاهده شد.

با توجه به اینکه 18.4% بیماران مورد مطالعه دارای MRI غیرنرمال می‌باشند کـه ارتبـاطی بـا یافته‌های معاینه فیزیکی نورولوژیک آنها ندارد لزوم انجام Imaging برای تمام افراد اپی پتیـک بالای ۱۸ سال (طبق کتاب merrit 2000)* کاملاً مشهود می‌باشد.

---

*- Merrit text book of neurology 2000

ABSTRACT:

Title : Identifying Prevalence Rate of epileptic's MRI Abnormalities which older than 18y (in neurology clinic of Amir General Hospital) between dates (20.1 2004 / 22.9.20004) in Tehran.

Definition : Epilepsy is a repeated seizure due to paroxismal electrical discharge from neurons in brain , and is manifested by one or some of these patterns: Loss of consciousness, seizure, gaze, automatism,...

Epilepsy is classified according to the location of Epileptic discharge in two categroy: Localized and generalized.

Objective: In this study, patients have been assessed for Identifying Total age prevalence of MRI Abnormality in epilepsy , and Age prevalence of MRI Abnormality in any type of epilepsies.

Material and method: This program Accomplished by filling Questionnaire for any patient. Method of study is descriptive, prospective and cross – sectional.

Rosult: In 76 patients, 14 of them had MRI Abnormality that 3 Cas in 18-24y , and 6 case in 25-34 y and 2 Case in 35-44 y and 3 Case in older than 45y.

According to type of epilepsy: one Case had sps, one case had CPS, 4 Cases had SGS, 2 Cases had myoclonic and 7 Cases had Generalized tonic clonic seizure.

دانشگاه آزاد اسلامی

واحد پزشکی تهران

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تحت عنوان :

بررسی شیوع MRI Abnormality درمصروعین بالای ۱۸ سال مراجعه کننده به کلینیک اعصاب بیمارستان امیرالمومنین تهران ازتاریخ ۸۲/۱۱/۱ تا ۸۳/٦/۳۱

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